Australian Model Engineering

March-April 1998

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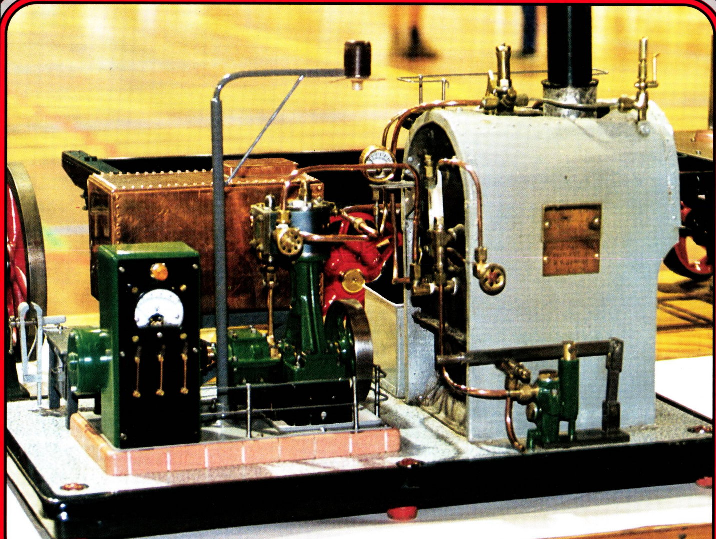

LOCOMOTIVES, TRACTION & STATIONARY ENGINES, BOATS, WORKSHOP, PRODUCTS, CLUB NEWS & EVENTS, REVIEWS

In This Issue:
- ☑ A Complete Quartering System for Locomotives
- ☑ Kiwi International Model Expo Report
- ☑ The Steam Tug *Yelta*

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The Cover

Seen at the NZ Expo (page 28).....A real work of art is the generating set built by J Hardy in 1937. It has a proper coal-fired Babcock and Wilcox water-tube boiler. Bruce Geange of Palmerston North rebuilt it in 1975 and fitted a new copper tank and pump and repainted it.

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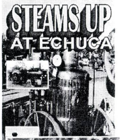

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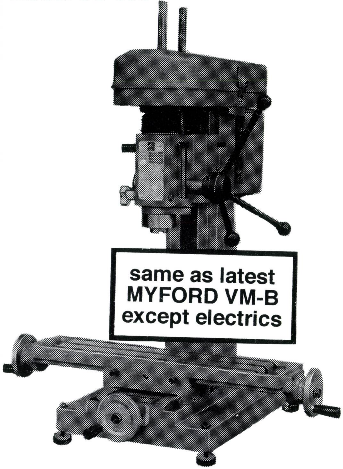

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Comment

Awe in a golden age

"I cannot express the amazed awe, the crushed humility, with which I sometimes watch a locomotive take its breath at a railway station, and think what work there is in its bars and wheels, and what manner of men they must be who dig brown ironstone out of the ground and forge it into that". These perceptive words were penned by John Ruskin a century ago.

No matter what our specialized interests, there is something in John Ruskin's awe of the machine that is in all of us. Beginners and masters alike, we are in this hobby because we're enthused — inspired — by the creativity of the artisans of days gone by. And their designs, their engineering solutions, are not just there to copy. They urge us to pursue our own creative designing. Therein lies one of the greatest pleasures of our hobby.

When people admire our work and say they are envious, they usually mean "I envy your satisfaction — through creating something with your own hands." In an age where many adult "leisure" activities are pre-manufactured and designed to be consumed passively, that's a strong reason to be envied.

The opportunity to create something with our hands has never been greater. Machine tools are affordable, and second-hand equipment is available at bargain prices because of radical changes in our manufacturing industry. With prudent budgeting, they are within reach of most people in the work-force. And never before has so much information been available — through networks of model engineers (AME's main reason for existing), through magazines, libraries, archives and the Internet.

Many people are grasping this opportunity. Some are retiring early, still full of energy, often with redundancy packages that help to upgrade or equip a workshop. Older model engineers are living a vigorous old age that their fathers couldn't have hoped for. Younger people are making their own challenges, often with encouragement from the two older generations.

Most clubs have grown quite significantly in recent times. And AME's sales show that the 54 per cent of its readers who aren't in clubs are steadily increasing too. In this part of the world, our hobby is thriving as never before.

The "golden age" of model engineering is here to be enjoyed to the hilt!

Clive Huggan

Join us in a great hobby!

If this is your first issue of *Australian Model Engineering*, welcome!

In successive issues we cover many topics centred on that wonderful process of model engineering — alias *tinkering*.

If you're new to model engineering as well as our magazine, you'll benefit from getting together with other model engineers — we're good at sharing ideas and saving each other money! If you don't have any contacts, start by looking in "Club Roundup" to find a club that's near to you. Many of our readers have discovered people with similar interests literally just around the corner.

"Helping other model engineers" is the simple idea of the volunteers behind this magazine. Our readers write items for us — for the same (non-existent) rate of pay! If you have ideas, opinions or techniques that you feel would be interesting to others (especially from the newcomer's angle), please drop us a line. We can send you a useful guide and help with preparing artwork or editing.

I hope you'll enjoy the great fellowship that makes our hobby special, and that you'll support our advertisers — after all, they pay our bills!

David Proctor
Managing Editor

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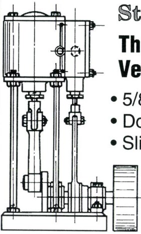

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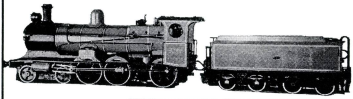

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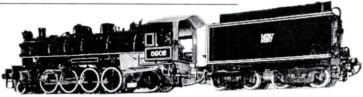

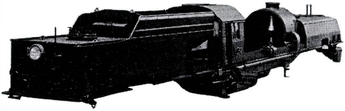

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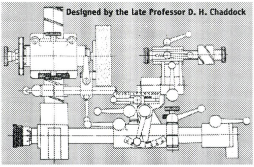

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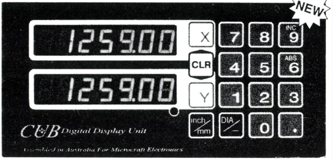

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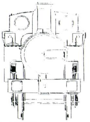

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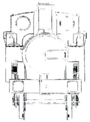

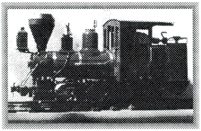

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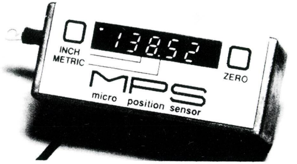

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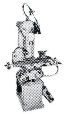

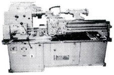

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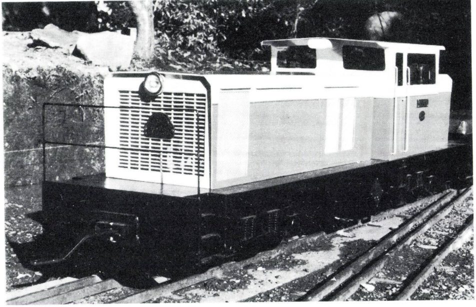
Cameron Roberts

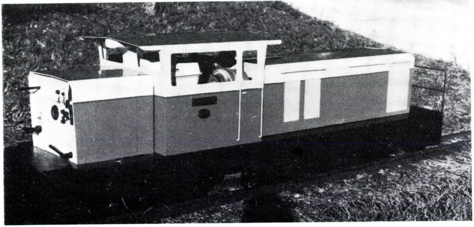
An Eimco Bo-Bo Cane Locomotive in 5" Gauge

Story and photos by Andrew Roberts

Last year I decided to look for a suitable design from the current sugar cane locomotives so that a 5" gauge petrol version could be built. I opted for this type of locomotive because of the large scale advantage of two and a half inches to the foot which would give more room for a larger motor.



(above and below) Two Views of Cameron Roberts *on the Wagga Wagga track on the day of delivery, resplendent in its brand new coat of green and yellow*



Measurements were taken from bogie type locomotives currently operating in the Mackay area, namely Baldwins, Eimcos and ex NSW 73 Class (now 94 Class). When measuring, I paid special attention to the cab sizes as I thought this would be the problem area when fitting a suitable motor. I found the Baldwin cab a little neat for comfort and with the 94 class, concerns over width, which left a choice of the 32 or 40 ton Eimco. In principle, I favoured the 32 ton Eimco *Farleigh* which runs at Farleigh Mill. I sought the assistance of two drivers in checking measurements, theories, and any history available. Tamrock Coal (formerly Eimco) had detailed drawings of the 32-40 ton Eimco which were made available, and the management and staff gave every possible assistance to enable the model to be built.

The Eimcos were designed in Zimbabwe and four were built under licence in Australia, all in service in the Mackay area. There are three 40 ton units at Marian Mill as well as the already mentioned unit at Farleigh Mill. In addition, a fifth unit which was imported from Zimbabwe, and the first to run in Australia, operates at the South Johnstone Mill at Innisfail. Over the years the Eimcos have undergone some slight changes to cabs and headlights etc. as per the various mills' requirements.

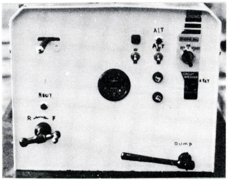
The search was now on for a motor which led me to look at a 5½ hp Honda with electric start and which would fit. Also under the microscope, was the Eaton Hydro unit. I also thought it would be in my best interest to look at other locomotives and sought the advice of Lionel Knobbs, who provided photographs and information on the operation of his model.

It had become apparent that building any part of this locomotive was not as practical as I once thought. I sought the services of Ray Catts of Wagga Wagga, a specialist in hydro drive petrol engines, to build this unique locomotive.

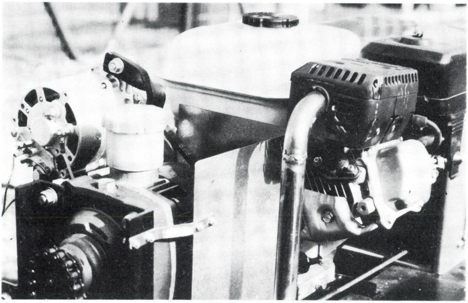
All the data was studied and the final design was based on both technical and personal reasons. Key points in choosing the design were

- bogies on the 40 ton loco give more room for drive shafts
- Honda 5½ hp motor and Eaton Hydro No 7 would fill the cab and last longer
- Windows the same as Farleigh Mill loco's cab side doors as per original plans
- Hour meter fitted working ex alternator for servicing and daily records
- Headlight to front instead above the cab
- Engine to work long end leading for better cooling. This would keep that Eimco look using a mix of the original plans and *Farleigh* which operates at Farleigh Mill.

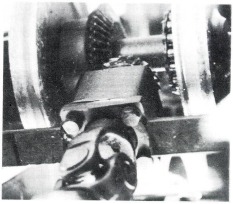
While the locomotive was being built, I had to arrange for the finishing touches — brass plates and the paint scheme. It was difficult locating a suitable foundry until I came across Phoenix Foundry at Uralla N.S.W. XS Graphic Mackay designed the plates in keeping with the Eimco design, to suit my engine. A quote was received after a copy of the artwork was faxed through and within three weeks the brass plates had arrived! All plates cost under $30 (price based on orders of three or more). To give an idea, the *Cameron Roberts* plate is 111mm x 28 mm x 5mm



A driver's eye view of the controls



Motor and hydraulic drive unit

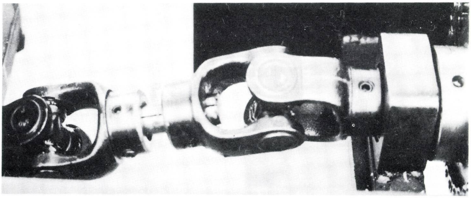


Drive to axle - note bevel gear and chain drive to other axles

thick and came lacquered. I would recommend Phoenix Foundry for any numbers and plates as they really make the engine stand out amongst the crowd. Finally came the paint scheme. Green and yellow with an orange stripe separating the two. This looked good on paper.

The time arrived to travel to Wagga Wagga to take delivery of my new locomotive. I arrived just in time to see this huge green and yellow locomotive going on to the turntable. Mine! A true replica of an Eimco! After a quick look at the drive shaft I soon appreciated all the work Ray had done. I was then trained in the correct operation of the locomotive. During the handover, I found it to be very quiet, no fumes, easy to drive with no wheelslip, control over any load up or down hill and no side ways movement. The locomotive looked like a brand new engine should — shining, and with the brass plates making a good model look even better.

I got in more driving practice at Orange before returning to Wagga for the NSW Interclub Meeting on 18-19 May. It was a wonderful weekend with *Cameron Roberts* leading a triple-header with two steam engines, an 0-4-0T Krauss, owned by Mark Pottie and my 0-6-2T Perry *Tully No 6*. It was a perfect opportunity to show off the work of Ray Catts before the long drive home to Mackay in Queensland.



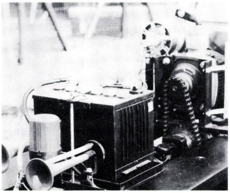
Two universal joints in the drive train to the front bogie

Major component details

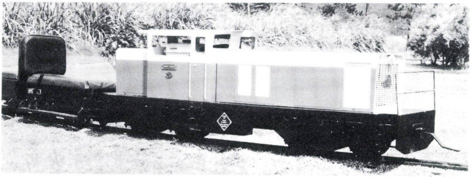
Honda 5½ HP electric start motor
Eaton #7 Hydrostatic transmission (clockwise rotation) with fan
8 off 6004 2RS wheel bearings
6 off 6005 2RS centre and bogie pinion bearings
32 off 3025 2⅛ x ⅞ x 8 turns Century springs
4 off 6001 2RS bogie pivot bearings
1 off 27t 08 simplex sprocket
1 off 14t 08 Simplex sprocket
4 off 16t 08 Simplex sprockets
1 box 08 Simplex chain
2 off 08 conn. links
1 off 3" pcd. al. pulley (alternator)
1 off A22 belt (alternator)
2 sets 40 D10P20 bevel gears (Ronson or Hercus)
4 off Spicer Universal joints ¾" bore (as small as you can get)
various steel sizes and electrical components
Axle boxes as per prototype available from E and J Winter.

If readers would like to know more about this locomotive they could contact me C/- Post Office, Eton. 4741, or Ray Catts in Wagga Wagga.

I would like to extend a special thankyou to the people and organisations already mentioned plus Barry Potter and Farleigh Mill drivers Kevin Bryant and Jim Caslin. Without their support and assistance *Cameron Roberts*, L1952 on Andy's Railroad would never have been.



Battery, air horns and chain drive

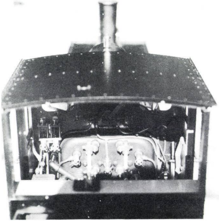


Our final view is of the loco at home on the author's railway amongst the sugar cane

Garratt Gossip

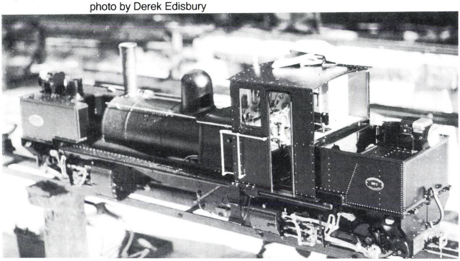
with John Cummings

In November I had a visit from John Doyle of the U.K. who is also building a 'K' class Garratt in 5" gauge. John made my day by presenting me with a copy of the original drawing of the headlight on the 'K'. He also gave me some photos of a 3½" gauge 'K' built by John Hartup from Lancaster.

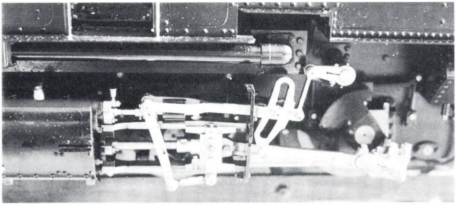


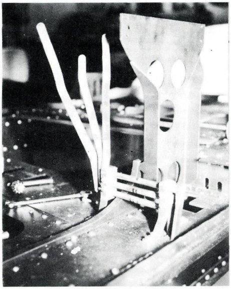
A peep inside the cab of John Hartup's 'K' photo by Derek Edisbury

On Christmas Eve I received a report and photos from Melanie Dennis and Eddie Mol on the construction progress of their Australian Standard Garratts. I found some interesting items in the report. One item was "Aust. Archives — Vic: Here we found the original tracings used to produce the blueprints sent out to the workshops for the construction of the ASG in 1943-46. They are in excellent condition having only been accessed once (by an unknown person) before us. When we originally applied a couple of years ago, they still had not been cleared for general access since World War II".



John Hartup's nicely finished 'K'(above) being prepared for a run and (below) a view of the rear LH valve gear Photos by Derek Edisbury

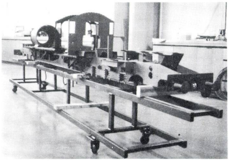




G25 showing (L-R) front sander, cylinder drain and rear sander levers and manual reverser stand. Photo: M Dennis

Another item of interest was about boiler construction. "BOILERS: In mid February, a welder and our resident honorary engineer (Richard Saberton) viewed the boiler drawings and recommended some alterations which went back to the drawing office for mark up. By mid-year we were ready to enter into discussions with ACT Work Cover (ex DLI), but by this time their main boiler inspector was off on extended sick leave and the ACT Govt. were not interested in replacing him: rather, they want to divest themselves of the responsibility and put the onus on the designers, builders and operators." (Is this the way of things to come?)

Early in 1997, a mate who operates the CNC lathe at work started turning my flexible steam connections to Bob Brown's design (see AME May-June 1995), but by the time I retired in June 1997, he had not finished the inner sliding half of the exhaust steam expansion joints which left me with a problem. How to turn the ball? Well! God must have had sympathy for me, because just before I retired a neighbour gave me an old copy of *Model Engineer*, May 1991. In it was an article titled *Optical Centre Punch/Radius Turning Tool*. It was just what the doctor ordered. I have built this turning attachment to suit my Hercus lathe and can say that it does a terrific job on ball turning, regardless of the diameter of the ball required.



G25's cradle sits on G16's engine units on the new lonnggg stand! Photo: M Dennis

Raindrops Keep Falling ...

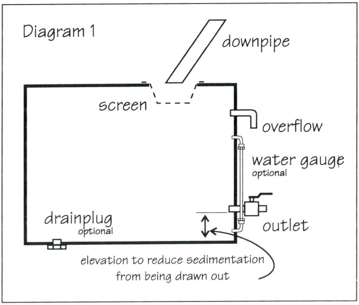
by Kevin Rossi

Hands up everyone who runs their locos using tap water...hmm. Wouldn't your loco, especially your boiler, love you if you used distilled water. Okay it's not cheap — even ridiculous! Well how about rain water, it's free! Oh you never thought of it, okay neither did I until recently, and that's why I'm telling you about some ideas I had on how to catch and store it.

Doing it

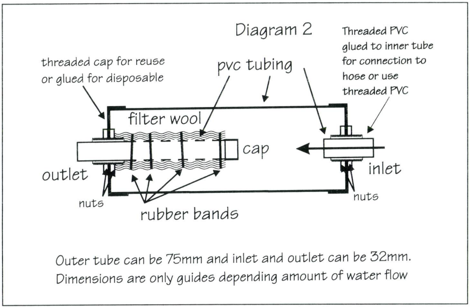
Basically all you need is a container, preferably elevated, positioned near, not necessarily under, a guttering. How many clubs have workshops, canteens - kiosks, station platform roofs, signal boxes, any building with a roof? The reason for elevation is water pressure. If you allow for a pump to be attached or possibly use a submersible fountain or a pond pump to send the water to various locations or for height differences, elevation is not required. Syphoning is too slow and virtually no pressure. Height is an important consideration in determining the amount of water to store and its weight. Approx 1 litre is 1 kilo ie. 100L = 100kg plus weight of container.

Diagram 1 shows the basic concept of the container with some elements.



Components

The purpose of the screen is twofold. Firstly to keep leaves, twigs, nuts, seeds and anything else that might be found in the gutter from going into the container. Secondly, because there is clean fresh water around there will be a congregation of mosquitos waiting to drop their eggs into this wonderful water in order to continue their life cycle. There are going to be a lot of mossies buzzing around unless of course you have an "insect-o-cuter" and enjoy watching them being zapped and fried. The screen is best made a semi-permanent fitting so as to be able to remove it and dispose of any debris caught and to allow a point of entry to access internal fittings.



The overflow is self explanatory and is placed preferably below the level of the screen. The overflow should also be of sufficient size to be able to handle a solid down pour and feed it out to the remainder of the downpipe or storm water drain.

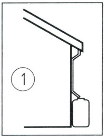
The outlet is self explanatory and is placed preferably above the bottom approx. 100mm (figure not mandatory) to reduce the outflow of sediment such as dust, road grime, coaldust and the like. If this is not enough then a simple filter can be made or bought. (Diagram 2 shows a simple aquarium wool filter that could be constructed.)

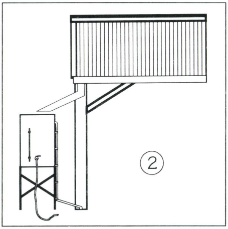
The water gauge is optional but it would be recommended if the container is the main water source so as not to run dry unexpectedly. I would also suggest that the bottom of the gauge be below the outlet so as to be able to see how close to empty you are and not be deceived into thinking the filter, if fitted, is blocked or there is some other sort of blockage when actually there is no more water and remedial steps need to be taken.

The drainplug is only required if the container is elevated and needs to be drained for removal of sedimentation or the container needs to be moved.

The container can be built from anything, bought or borrowed. Old oil heater tanks, as I have seen someone use, are a ready and handy unit complete with stand. The ever handy 44 gallon drums suitably cleaned and stop rust treated would be a convenient multi-unit set up. Even used food transportation barrels (200L) which are advertised in the papers or the local markets are convenient. The advantage of custom building one is it can be any shape and put anywhere you can want to put it.

Some examples



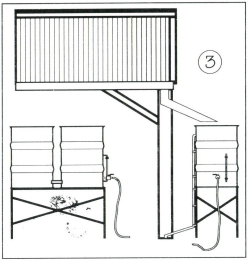


1. The simplest type of set-up is with a food barrel to catch the rainwater. The barrel can be transported (or water pumped else where — this is where a

submersible pump comes in handy.)

- 2. At the end of a station platform or outside the workshop, near the round house or staging facilities. Coal or other items could be stored underneath what could also be the stand for the container.
- 3. A similar set-up to above except 44 gallon drums are used. Two are shown, with a connecting pipe so as the rear one acts as a reservoir rising and falling with the first one. A breather hole will need to be made in the second one for it to rise and fall.

I hope this has given some ideas for catching this nice clean water and storing it. It can be used for other things like washing down locos or tending gardens if there is an abundant supply so as to help clubs save some money in water rates. Keep on steaming!



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TGR Type Loco Buffers

by Chas Goodwin

drawing for publication by Neil Graham

This is the method used by this old buffer for fabricating buffers as used on Tasmanian Government Railways locomotives

These buffers differ from the piston rod type buffer in that they are the cylindrical plunger type. The measurements are for one sixth scale, however, the measurements can be altered to suit your own project.

I considered three methods viz.

- A 50mm square steel base with a socket welded to it.
- Use a piece of 50mm square stock a bit longer than need for two buffers and machine the barrel on each end then saw into two bases. (As an aside, I have used this method when making axleboxes from cast iron stock. I have found this method ensures an identical left and right pair of boxes).
- Make a pattern and use a cast iron base.

I decided to go for the cast iron base method. A wooden pattern was made, having about three degrees taper on the square edges and barrel. On receiving the cast iron bases back from the foundry, I first levelled and sized the base edges in the vertical mill. A shaper would do the same job.

The first maching job was making the plungers, 48mm lengths of black BSP, which had a fine dressing up cut on both the inside and outside.

I then lined up the castings by the square base in the four jaw chuck and turned the round portions parallel. Next I bored a 6.3mm (1/4") hole right through. This hole was then enlarged out just enough to accept the plunger to a nice sliding fit. The depth was 45mm.

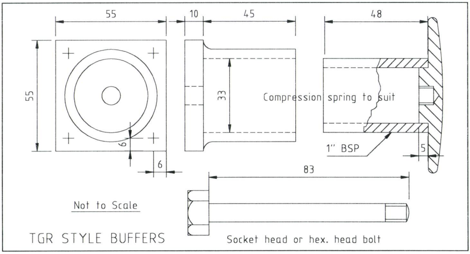
After completing the four bases the barrel sections were chucked in the 3-jaw and the backs of the bases machined down to 10mm thickness. The 4 x 5mm (or 2BA) bolt holes were drilled on the drill press. That completes the bases.

The discs could be cut from round steel stock. I scrounged five rough looking discs, 10mm thick, from the offcut bin of a commercial workshop. A 30 to 50mm length of 1¼" BSP with both ends machined square was tack welded to a disc for the purpose of holding the disc in the 3-jaw chuck. The disc was turned to a finished diameter of 70mm. The thickness was reduced to 5mm and the exposed 5mm of the hub machined for a tight press fit in the plunger. I then bored and tapped a blind hole 8mm deep which later accepts the one assembly bolt.

By the way, (typical of me) I have since learnt the other method of holding the assembly together. Instead of a central bolt which must protrude through a hole in the buffer beam, a short screw is threaded through the round base on the under side, the end being in a slot cut in the plunger. The short screw acts as a stopper.

Now back to the vice, cut throught the tack welds on the discs, grind off the blobs. Press the plunger onto the disc (a bolt and washers can be inserted and pulled up to ensure the disc stays put during machining of the face) and then back to the 3-jaw and finish turning the face of the disc. I turned my top slide 85 degrees so that the five degree taper created a sort of convex face. The perifery thickness is 3mm.

A scrounge of the parts box is all that is needed for suitable springs and bolts to complete the assembly of each buffer and a coat of paint completes another part for a locomotive!



Steam Chest

with Dave Harper

Hello again, steam fans, we're off and running with a new editor in the new year. It's been a pleasure working with Brian Carter these past four years, and I think the magazine is still going from strength to strength. Thanks, Brian, and welcome aboard David Proctor!

The article on Dave Sampson's shuttle valve prompted a fast response from Peter Lukey of Babinda; he pointed out that a similar scheme was published in the *Model Engineer* back in 1981. I spoke to Dave Sampson about this, and he freely admitted that those articles gave him the idea for his system. The original Don Gordon design actually used two valves working one within the other, and there is a comment in the second article that it should be possible to use one valve only. Incredibly, the Don Gordon Weir pump was even smaller than Dave Sampson's, which Dave himself finds hard to believe!

Thanks for your interest, Peter!

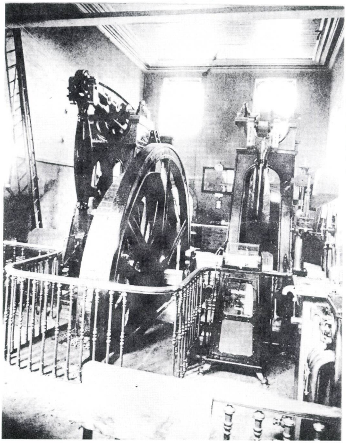
I guess that's how machines have always evolved, one man's work building on previous knowledge and ideas. Which neatly brings me to the next subject, the development of beam engines.

More on the beam.

Just when I start to think I'm getting a grip on this steam engine business, Dave Sampson puts another book in front of me that blows me away again! This time he showed me more of George Watkins' work. This remarkable man spent most of his time from the thirties right up to the late 1950s travelling around and photographing the remaining stationary steam engines all over the UK. His work has been published in several volumes called *The Stationary Steam Engine, The Steam Engine in Industry*, (2 vols) and, now I find, two more volumes covering *The Textile Mill Engine.*

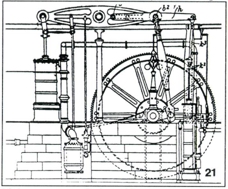
It was reading these last books which I found blew away all my preconceived ideas on beam engines! Not only are there double beam engines, with a flywheel between them, but there are compound and triple expansion beam engines, and beam engines with an extra 'pusher' piston working on the crank!

The two volumes were published by David & Charles in 1970 as part of their Library of Textile History. They cover the whole range of engines from simple single cylinder types up to four cylinder triple expansion monsters.



The first illustration (below left) is a double beam engine built by Goodfellows of Hyde for John Taylor and Co's woollen mill in Huddersfield in 1856. Its cylinders were 27" bore x 3' 6" stroke for steam at 30 psi. It was later converted to a compound by fitting cylinders of 17" and 29" bore for 110 psi. It then gave 200hp at 48 revs/min. Drive was by a toothed ring on the flywheel arms to an underground shaft by a single pinion. It powered the mill for 86 years!

Numerous other methods were used to upgrade early beam engines, **drawings 21 (below) and 22** show two ways of adding a high pressure cylinder without over-stressing the engine bed.



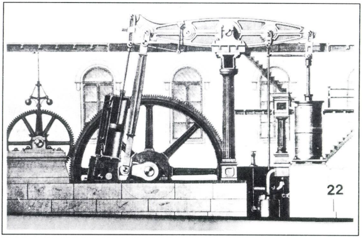
21 shows Evan Leigh's patent design of 1863 which extended the beam by a couple of plates , while the other one shows Bagshaw's method used in 1875 which required a complete new beam.

Who will be the first to compound a Stuart model beam engine?

Next time I'll include a couple more of these remarkable old engines.

Red Fred going slow.

I'd like to thank the several people who passed on tips to help me with the Red Fred railmotor project. It's been going very slowly over the Christmas/New Year break, and the hot, humid weather hasn't helped much either! It's been much easier to sit in front of the fan with a good book! I seem to be up to my ears in newly acquired books at the moment, which is great for me, but hell on AME deadlines!



Drawing No. 22

Whitworth, the man

One book I've recently bought will, I think, be of interest to many readers. It is the first full biography of Sir Joseph Whitworth, justly sub-titled *'The World's Greatest Mechanician'*. I only found out about it via the Newcomen Society, of which I am a member. Their bulletins frequently have book reviews among other interesting articles.

The Whitworth biography, by Norman Atkinson, published by Sutton Publishing, was first published in 1996, and is now available in paperback ISBN no 0-7509-1648-6. When I first started chasing it, I was told it was out of print already, but another bookshop looked a bit harder and found the paperback edition still available. I got my copy from them, the American Bookstore in Brisbane. It's quite a tome of over 300 pages, but what I've read so far points to it being a very thorough and readable account of those formative days of the machine tool industry.

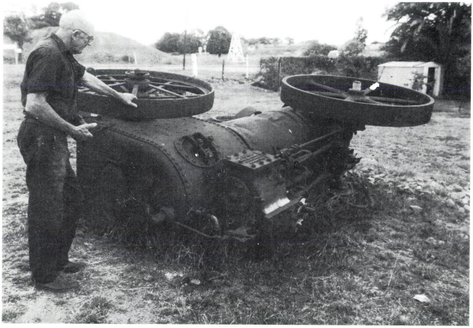


Photo 1

Travels with Kenny

Continuing with the story of my trip to North Queensland with Ken Saunders...

Last time I left you on Day 4 at Totley silver mine, near Ravenswood. Incidentally, there was a booklet published by James Cook University on Totley, written by C A Kennedy. Thanks to Peter Lukey again for showing it to us! It doesn't seem possible to buy a copy now, but I obtained a copy from JCU on interlibrary loan! It certainly fleshed out the story. But I digress.

Leaving Totley we headed back into Ravenswood where, on the road out towards Charters Towers, our next stop, we found a whole field littered with bits of steam engines and boilers, plus the remains of a gold stamping battery. This was the site of the original Ravenswood Mining Company, and is opposite the old railway station, now being refurbished as a tourist information centre.

Photo 1 is of a Garrett portable which Kenny reckoned wouldn't pass the boiler inspection!

Photo 2 is of one of many winding engines we saw on the trip. Similar to a steam winch, they are relatively simple and I'm surprised that more models of such engines aren't seen.

Leaving Ravenswood, we reached Charters Towers in the late afternoon, found ourselves a caravan park and then a good Chinese meal to round off a full day.

Next morning we arranged to meet Geoff West of the CT Water Board who had promised to show us the unique Hathorn Davey differential pumping engines still sitting beside the Burdekin River where they had been installed in the 1890s.

Before that, we had a quick look around the town, and found the Venus Battery, one of the many gold plants in this most productive of Queensland's gold towns.

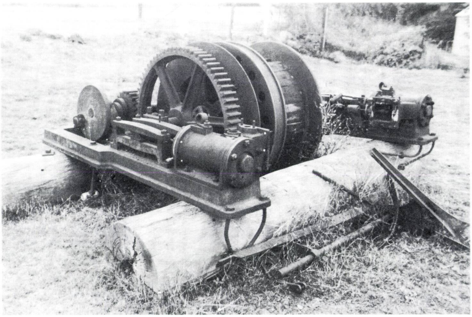
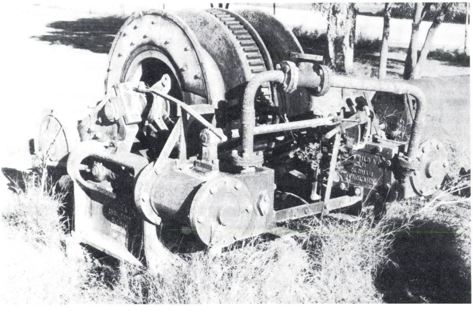


Photo 2 *(above) and* **Photo 3** *(below)*



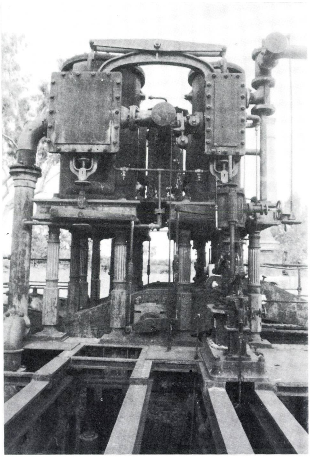


Photo 4

There we found the ubiquitous winding engine, **photo 3**, this one at least having a makers name on it, John Wild of Oldham.

Then it was off to meet Geoff, who turned up right on time, and we followed him along miles of dirt track to the old water pumping station. This was definitely one of the highlights of the trip, and we are grateful to Owen Peake of Darwin, and Peter Lukey (again!) for giving us the contact with Geoff West.

I hope to put together an article on these engines shortly, as a follow-up to the Spotswood engines that were featured in the Nov/Dec1997 issue of AME. Meantime here are a few pictures I took that day. **Photo 4** is the front-on view, showing the HP and LP cylinders, with the beams underneath and the differential engine in the right foreground. Also note that all the wooden floorboards are long gone, and I was tippy-toeing around on the steel girders over a thirty foot drop into the pump wells taking these pictures! Not for the faint-hearted, I can assure you! The things we do for steam engines.

Photo 5 is the view from the right hand corner. Note the 'floating' beams connecting the piston rods via a parallel link motion, with the main rocking beam. This main beam operates various linkages, visible in photo 4, whose aim is to keep the two cylinders working in phase and to prevent a catastrophic runaway should something break. The scale of the engines can be judged by the fluted columns which are about 6ft tall!

Photo 6 is a profile of the differential engine, with its multiplicity of links and levers. The small unit in front, to the left in the photo, appears to act like a cataract in controlling the speed of the engines, and also operates a trip lever that cuts of the steam in the event of a runaway.

The whole set-up is incredibly complicated, and even after studying the real thing for quite a while, and reading the information kindly provided by Owen Peake, I'm still not sure I fully understand it! Owen assures me I'm not alone.

Other remnants on the site include the old boiler chimney and the base of the flying fox that used to span the river to bring timber over to fire the boilers. A narrow gauge railway apparently ran along the far bank, and people are still trying to piece together details of the engines that were used. Typically for the period, every tree within miles was soon felled to provide fuel, and the track was constantly extended.

It's sad that these unique engines are being left to rust away, even though they are heritage listed. All that this achieved was to prevent the differential engine being taken away for restoration! However, when you consider that there would be over a thousand tons of iron in the two engines and their pumps, the prospect of moving them takes on a different complexion! They are way off the beaten track, so are not really a viable attraction where they are, but they are perched right on the edge of a high bank of the Burdekin River. It's not beyond the bounds of possibility that a major flood could wash the whole lot into the river or at least undermine the foundations. Geoff West and Owen Peake would love to hear from anyone with a constructive and practical solution! I'll happily pass on any you care to send me!

Back to our trip - by lunch time we'd about covered the pumping engines, and thanking Geoff for his help we finally found our way back onto the main road and headed North again. We had lunch beside the Burdekin where it cuts through the Great Basalt Wall, and enjoyed a great geological discussion while we ate!

Deciding we should push on, we drove long into the evening, leaving the dry savannah country as we crossed the Great Divide at Millaa Millaa and dropped abruptly into the lush tropical greenery of the north coast. We ended up late that evening dining with none other than Peter Lukey and his charming wife Gwen in their house right next to the sugar mill at Babinda.

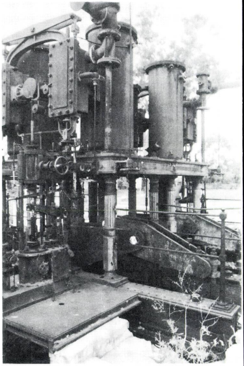


Photo 5

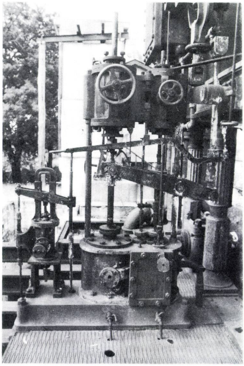


Photo 6

After a good feed and much talk we were nodding off over our drinks, and gratefully fell into the beds Peter and Gwen offered! More next time!

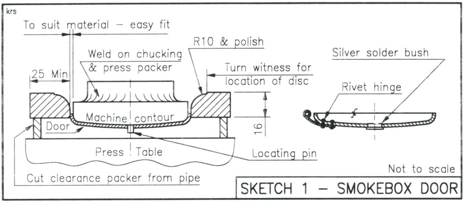
I don't seem to have any photos of model steam engines for this issue; maybe because I haven't taken any for a while, also because nobody has sent me any! I'm sure there must be some modellers out there with model stationary steam engines that we could publish photos of. Please send me some!

That's about it for this time, until next time, happy steaming!

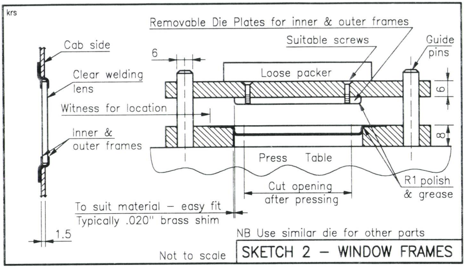
Why Not Fabricate

by Kevin Bruderlin

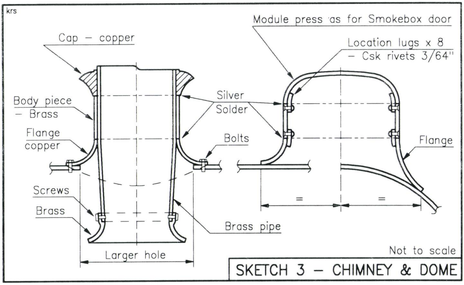
drawings for publication by Rex Swensen


krs
To suit material – easy fit
R10 & polish
Weld on chucking & press packer
Silver solder bush
25 Min
Turn witness for location of disc
Rivet hinge
Machine contour
Door
16
Press Table
Locating pin
Cut clearance packer from pipe
Not to scale

SKETCH 1 – SMOKEBOX DOOR


krs
Removable Die Plates for inner & outer frames
Cab side
Suitable screws
Guide pins
6
Clear welding lens
Loose packer
6
Witness for location
Inner & outer frames
8
Press Table
R1 polish & grease
Cut opening after pressing
To suit material – easy fit
Typically .020" brass shim
1.5
NB Use similar die for other parts
Not to scale

SKETCH 2 – WINDOW FRAMES



SKETCH 3 – CHIMNEY & DOME

After reading articles about moulding and casting various items, I feel spurred to offer an alternative for making these components, namely fabrication. I do not bother much with photographs but the accompanying sketches should explain how the various parts were made for my models, plus some suggestions.

The **smokebox doors** (**Sketch 1**) were made quite simply using a method we used to make the ends of various pressure vessels in full size. This consisted of a mushroom headed die and a machined ring for the female die. The disc for the door should be cut as accurately as possible, allowing an extra 1.5mm in diameter for clean up and easier pressing.

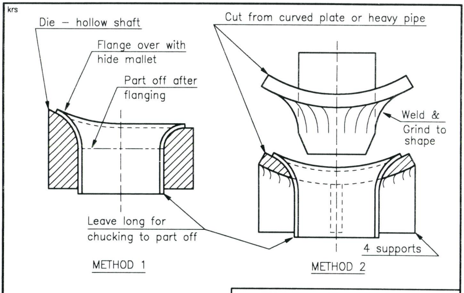
Sketch 2 shows how the cab side **windows** were made for my "King". The principle can be applied to other shapes with a little thought, care and accuracy.

I fabricated my **chimneys** as shown in **Sketch 3**. A similar method can be used to make **domes**. It's not really hard but a little time consuming getting all the parts correctly made. Making chimneys by this method gave me a larger hole on top of the smokebox to fiddle through. Copper was used for the flanged section, but there is no reason why mild steel could not be used instead. Brass can be used but it needs to be soft and an awful lot of care to avoid splits. Worth a mention is that usually the part of the chimney that bolts to the smokebox is larger than the skirt diameter of the petticoat pipe, which is why you get a larger hole for fiddling.

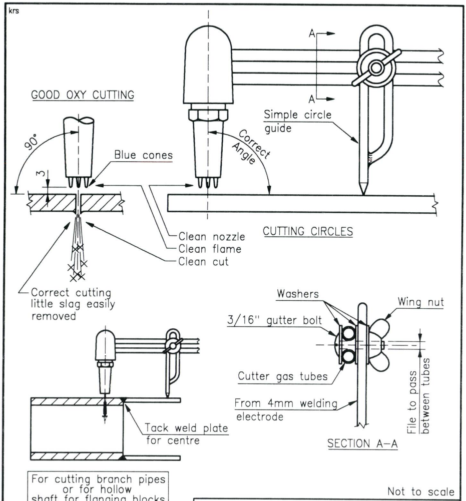
My chimney **flanges** are hand flanged with a hide hammer but there is no reason why a shaped male-female die can't be used. **Sketch 4** shows two methods. My flanges were done with a hollow shaft method, oxy cutting and carefully grinding and filing to suitable shape. With method 2, you cut a hole with the oxy and carefully cut, grind and file the radius in a suitable curved piece of at least 16mm plate or cut from suitable diameter heavy walled Schedule pipe. Drill a 3mm hole near the cutting line to start the cut and warm the material before actually commencing to cut.

Now some will say **oxy cutting** is too rough. Rubbish! Without going into a lot of technical jargon, most folks not really conversant with oxy cutting get into trouble for (a) a dirty nozzle, (b) incorrect gas pressure, (c) incorrect nozzle size or (d) incorrect cutting speed. Material should be clean and grease free.(Refer to **Sketch 5**). The correct distance from the nozzle to the plate is when the tip of the blue flame cones 3mm from the material being cut. For cutting hollow shaft or 16mm plate a #12 nozzle (old no.2) is quite adequate with gas pressure of 35kpa (5 lb) acetylene and 200kpa (28 lb) oxygen, maximum. If using propane, increase your oxy pressure to about 1½ to 2 times (280 - 300kpa). If you are not getting a clean cut with these pressures and a clean nozzle, you are probably travelling too quickly. If you have clean material (not ground or filed) a #8 nozzle and 160kpa oxy pressure, it's possible to cut 25mm plate. 20mm is easy — try it!

It is the chemical reaction of the oxygen with the steel that does the cutting, but that's a bit too involved for discussion here. Perhaps some of our good friends at BOC (CIG) could be persuaded to write an article for AME on that subject. At the risk of sounding like a nag — don't forget your oxy glasses when using oxy cutting gear and grinding goggles when grinding!!



SKETCH 4 – MAKING FLANGES



SKETCH 5 – OXY CUTTING & AIDES

Remember..you can e-mail your letters and articles to AME

ame@dynamite.com.au

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A Complete Quartering System

by Peter Dawes

Photos by the Author, drawings for publication by Rex Swensen

I would like to think that this method is the last word on quartering but of course that's optimistic. But it certainly *is* a complete system for simultaneous keying and quartering with total reproducibility. It's also a system that's ideal for making many locos of the same type.

Getting started

It requires a broach, either ⅛" or 3/16" (¼" for very big locos), and it follows that a press capable of driving that broach is required. There are three jigs to make, and one precision reducing bush will probably be needed.

Silver steel is recommended for the axles and pins. While ten times the price of mild steel, the extra cost is a small part of the total value of a loco and it should make a better axle. Precision ground mild steel is about twice the cost of plain round. The user has to decide between them.

This article will concentrate on 5" gauge, ¾" diameter axles, ⅝" thick wheels, 5/8" main crank pins, 7/16" coupled crankpins, and ⅛"x ⅛" keyways only because that is what I was using. Since then I have opened out the ⅛" keyways to 3/16" for greater accuracy to scale.

My axle journals are the same diameter as the wheel holes so the axles required only cutting to length, cutting the keyways, and centre-drilling via a collett. This is where ground steel comes into its own. Shouldered axles are discussed under jig #2.

Journal surfaces should be given a high polished finish.

Press fits and hole measurement

The system assumes press fits for the axles and crank pins with keys on the axles but not on the crankpins. I find that machining bores to close tolerance is one of the hardest of all lathe jobs. But the success of press fits depends totally on boring to much better than a thou tolerance.

The best way for beginners to measure bores is with the telescopic hole gauge and a good ratchet micrometer. Vernier calipers are just not adequate. The alternative is an internal micrometer for sizes over ½".

For holes under about ½" use a so-called "small hole gauge", which is like a pair of half-spheres that are spread apart by a screw adjuster in the handle. To sidestep accurate boring, use a reamer to finish holes — but it's only applicable if the hole is a standard size.

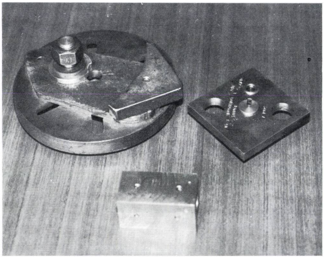
Reaming

Where a bore is specified as a close clearance fit of a standard size, it is quite in order to finish the last thou or so by reaming. This is faster and a good deal less demanding than precision boring and is recommended as long as the reamer is exact size and the ground stock fits its hole. It is up to the reader to choose his method.

Take note that some second-hand and low quality reamers are *not* exact! But if you do come across a reamer in a common axle size that cuts one thou undersize, mark it, treasure it, and use it for press fits. It will save a lot of time and work.

General tips on broaching

Don't underestimate the force that broaching requires and do *not* try to do it in a vise. An arbor press is required and from my experience, a 3 tonne press ("No 3") is the minimum size I would have to recommend. The press is used also to the press wheels on the axles and is far better, safer and more versatile than a vise.



The three jigs which are made in this article. Jig # 1 (left) is attached to the faceplate.

Mounting the press

The press should be firmly bolted or clamped to a solid bench because it requires great leverage. There must be clearance under the anvil for the broach to pass through the job. Because a No 3 is only five inches (125mm) from anvil to base, it should be raised on three inch (75mm) blocks of wood. Putting a hole in the bench under the anvil would also work but then broaches can drop through onto the floor and that is not good for them.

Just for information - a No 3 press has a ram 1.5" square with rack teeth of ⅜" pitch. The handle is solid chromed steel 7/8" diameter by 22" long. It makes a 7" stroke for one full turn of the handle. The No 3 press is listed by Hare and Forbes of Parramatta at $299 plus the usual 21% sales tax (as at the time of writing).

A smaller press is illustrated in the article on broaching in *Model Engineers Workshop*, Nov/Dec 1994, P49 but I have never seen one of these in Sydney. It seems to achieve the necessary force by a powerful toggle action. This implies a correspondingly shorter stroke so broaching and pressing would require multiple steps with spacers added in increments to get any reasonable distance. My guess is that it has a ½" stroke with its cylindrical ram.

Just with the aid of the photo, there is no doubt the hobbyist could make one of these by fabricating it out of ½" plate if he is prepared to trade his time for the money saved. Because it doesn't need a rack, construction is simplified enormously. There would be some oxy cutting and heavy arc welding however. The article also contains other useful information on broaching.

The ram of the press *must not be loose* side to side. There are gib screws on two sides that can be adjusted to remove any slack. Needless to say the path of the ram must be at right angles to the anvil surface or the broach could be broken.

There is no need to hold the top of the broach in a holder or chuck. If it is square-on and the bottom of the ram is flat, even, and free of oil, then it is okay to just apply the pressure to the end of the broach.

The usual type of broach is the "push" type. Broaches from Dumont of Greenfield Mass. (USA) are the ones usually encountered and these usually come in sets complete with guides and packing or spacing strips. These broaches are about 6½" - 7½ " long.

The packing strips are required to make a second or even a third pass in order to cut a keyway deeper than is cut by a single pass.

The complete sets are far too expensive for modellers, so try to get just two sizes second hand, ⅛" and 3/16". I got a 3/16" broach in very good order for $45 (which is under half price).

Don't accept one that has a damaged tooth unless this is at the top or the bottom end. Damaged or blunt intermediate teeth make it unusable and it can only be restored by sharpening *all* the teeth. Clearly, if you were to just sharpen that one tooth, the next one above would have twice its normal load and probably fail. The damaged tooth at top or bottom can be ground down reducing the depth of cut per pass, but that is not a big issue. It may even be a help if the press is being taxed to its limit.

You can make your own guides and packing strips from mild steel stock. Remember to cut the slots for the guides (with a slitting saw or Woodruff cutter) before parting off from the bar stock. To measure the depth of cut per pass, measure the depth of the broach at its first and at its last tooth. The difference is the cut per pass, and that number divided by the number of teeth is the depth of cut per tooth.

Some broaches cut 1/16" per pass (ie about 4 thou. per tooth) which is possibly deep enough to require only one pass but this type certainly takes a lot of force to push it through. I could just cut one tooth in steel with a three foot extension arm on a No 3 arbor press with one of these. In a cast iron wheel 5/8" thick it was easy. One way to ease the force required by a wide broach (such as 3/16" or 1/4") is to run a 1/8" broach through first.

You can do this with the same guide if the two broaches share a common back thickness. The Dumont 1/8" and 3/16" broaches both have 3/16" thick backs so they can run in the same guide, although they may require different packing strip thicknesses.

Other broaches are designed to cut 1/32" deep per pass so they will need two passes to cut a 1/16" deep keyway. To get an extra few thou for top clearance do not make a partial pass. Make a half thickness spacer and push the broach right through again even though it will only be cutting with the teeth in the top half. With any luck, you can cut close to 1/16" in either one or two passes. You can then get top clearance by just cutting the axle keyway the extra depth. This is allowed for below when cutting the axles under jig #2.

Use the appropriate cutting oil on steel, aluminium, and bronzes. It isn't needed on cast iron. Although it doesn't have the high tensile strength, aluminium has a sort of *sticky* quality and cutting oil can make a big difference.

In general you should not drive the broach back up the hole to withdraw it or to make another pass. You should always push it right through the job and then put it back in the top again. This helps to prevent micro-chipping of the cutting edges. This is also why adequate clearance has to be provided under the anvil.

Pushrod extension

A useful accessory to make is a pushrod to push the broaches through long bores. This can be made of M.S. but tool steel is better - such as an old piece of screwdriver shank. Two to three inches long is a suitable all-purpose length. Grind it down on the sides to the same cross section as the broach, or just under, and grind the ends absolutely square and flat.

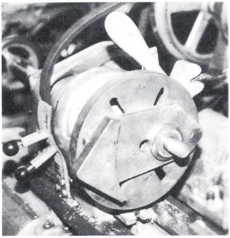
When setting it up, make sure the broach is vertical in the radial direction. Align the job so the broach is approximately under the centre of the ram because this minimises any tendency for the broach to be thrust sideways by play in the ram.

I have found that broaches can develop a radial lean for no apparent reason. It is more likely to happen when the guide bush stops immediately at the bottom end of the hole. If it happens to you, stop and back out slightly, correct the lean by juggling the broach by hand. Set it vertical with an engineer's square before continuing.

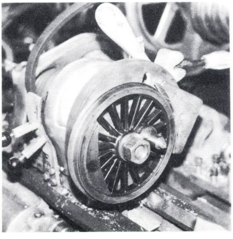
The job must be supported squarely and firmly on the anvil. This is why the wheel hubs must have been machined before you start broaching. The No 3 press has a rotating anvil with four different size openings. Select the smallest diameter opening so as to give the greatest support while still allowing the broach to pass through.

Never, but never ever, hammer the broach, even with the ram of the press. If you cannot push it through, stop and take stock. Push it back out and try a new way. If you do yield to temptation to hammer it, and you get away with it, buy a lottery ticket, its your lucky day!

One way to keep the lever in the optimum pulling position is to arrange different thicknesses of packing pieces under the ram end, moving the lever in steps of about 45 degrees each time. That's optional. The ideal is a slow steady continuous cutting action. If it suddenly goes very tight, stop. It may be seized up or the force is inadequate. Or there may be an obstruction. Check these possibilities before carrying on. If it definitely won't move, turn the assembly over and push the broach back out - *carefully*.



Quartering Jig # 1 on the faceplate (above) Note counterweight, and (below) we see it with a wheel on it. This wheel already has its crankpin.



It's very easy to cut a keyway in any wheel if you have a guide ready for that size. With loco wheels the hard part is ensuring the keyway is in a very particular place on the circumference. When this is not an issue, you can just drop the guide bush into the bore and cut a keyway in seconds. Keys are the only really reliable way to lock gear and chain sprocket wheels.

N.B. Broaches must be guided for a minimum of the full length of the bore, preferably somewhat more.

Long bores are more difficult to broach but only because more teeth are cutting simultaneously. You may have to start by running a narrower broach through just to make the load acceptable. A broach for a long bore should have a smaller cutting depth per pass and a cut of no more than 2 thou. per tooth. It's not difficult to grind the back of the broach to alter it's slope - if you have access to a surface grinder that is. Most clubs will have at least one member who has one.

A trick that helps coping with long bores and difficult presses is to pack the back of the broach only enough to allow a quarter of its length to cut. Suppose the broach has 16 teeth and cuts 1/16" per pass, if the spacers are in multiples of 1/64" the cuts are reduced to that depth and only the top few teeth will be cutting on each pass. It will multiply the number of passes required but it will get you there safely.

Contrast this with a 3" bore and cutting the full depth at each pass. There would be 6 or 7 teeth cutting simultaneously. The load could well be too much for you and the press to handle, even in aluminium alloy.

When pressing parts together that must maintain a particular orientation such as keyed parts, put a temporary or permanent key in the slots to maintain alignment while pressing, because the parts have a habit of twisting. Once they shift they cannot be corrected except by pressing them apart and starting again.

Troubleshooting broaching

The problems likely to be encountered are in order of decreasing importance:-

- Insufficient smoothly controlled pressure available.
- Ditto
- Broach not vertical and not under centre of ram.
- Damaged teeth or tooth. This is an absolute contra-indication to continuing.
- An obstruction, probably somewhere under the anvil.

Quartering jigs

There are three main jig parts and one minor part:-

The main parts:

i) the crankpin jig to bore the crankpin holes in the wheels;

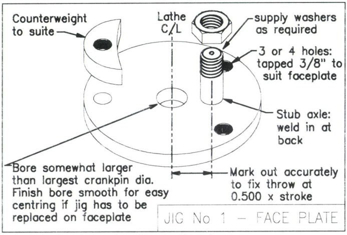
ii) the axle jig - a square block for milling the axle keyways at 90 degrees.

iii) the broaching jig - a plate to hold the wheels for broaching the keyway.

The minor part:

iv) an accurate reducing bush to bring the coupled wheel crankpin diameter to the driver crankpin size. In my case this was 7/16" to ⅝" diameter, and length slightly longer than the coupling wheel crankpins.

Make the bush from a piece of solid round stock just larger than the larger OD. Bore an end out for a clearance fit on the smaller crankpins. Turn the outside diameter to the larger crankpin diameter (close clearance fit in the hole in the broaching jig, jig #3), and finally part it off to a length somewhere between the length of the coupling crankpin length and the thickness of jig #3.


Counterweight to suite
Lathe C/L
supply washers as required
3 or 4 holes: tapped 3/8" to suit faceplate
Stub axle: weld in at back
Bore somewhat larger than largest crankpin dia. Finish bore smooth for easy centring if jig has to be replaced on faceplate
Mark out accurately to fix throw at 0.500 x stroke

JIG No 1 – FACE PLATE

Tolerances are ideally about a thou.

#1 - The crankpin boring jig

Essentially what this jig does is ensure that all wheels have exactly the same crank throw - equal to half the piston stroke.

It provides for boring the crankpin holes at exactly the same radius on all wheels and it doesn't depend on marking out on the wheels.

Make it out of any piece of clean flat 8-10mm (5/16" - ⅜") steel of a size and shape that is suitable for bolting onto the faceplate.

It is assumed that the wheels have already been partly finished, with the axle holes bored and the hubs faced off. I won't deal with these preliminaries or with any of the actual wheel finishing processes here - ie treads, sidewalls, and flanges, as it is out of the scope of this article). This must be done first because we do not want to have to take this jig off the faceplate once it is started.

Also bore the axle hole for jig #3 before tying up the faceplate unless you opt to do it with one of the chucks. It is always far better to do all axle bores at the one time, including those on the jigs. Precision bores should only be tackled when you are relaxed, refreshed and in top form.

The axle holes should have been bored for a press fit. For a ¾" axle this interference fit would be about 1 thou. if based on the rule of thumb of "one thou. per inch of diameter".

A radial line defining where to locate the wheel to bore the crankpin hole should also be marked on *each* wheel beforehand. This is not a critical line. It is usually the line joining the centre of the axle hub to the crankpin hub and is best laid out by eye. The distance to the crankpin doesn't have to be marked on the wheel because the jig will determine it for all wheels absolutely identically.

Mark the jig itself accurately for the axle and crankpin centres. This marking out must be accurate because it will set the stroke of the engine once and for all.

The jig plate will need holes to bolt it to the faceplate. Bolting it from the back into tapped holes in the plate is the best way. If the jig is made with the crankpin central and the axle offset, it will help to balance the whole assembly when the wheel is bolted onto it. That's optional.

Make a stub of axle steel just longer than the width of the wheels, plus the thickness of the plate, plus 1". Before cutting the stub off from the bar, turn the last 1" down and cut a thread about ½" to ⅝" diameter to take a thick washer and nut to fasten the wheels on to bore the crankpin holes. This stub is then tack welded flush into the plate at the back to stop the nut from just pulling it out of the plate.

Alternatively you can bolt the wheels on through the spokes. How? I leave that to the builder, but I have found that a big nut on the stub axle is quite adequate and more convenient.

Turn the main shaft portion of this stub axle down for a gentle push fit in the wheel axle holes leaving the end part full diameter for the press fit in the jig plate. Part it off.

Bolt the jig onto the faceplate and centre the axle crosslines. Bore the hole a press fit for the stub axle. Remove it from the faceplate and press the stub into it. Tackweld the stub at the back and grind off any projecting metal.

Now replace the plate on the faceplate and centre the crankpin crosslines. Bolt it down tight now because it will be staying there for quite a while.

Bore this hole to the crankpin diameter or slightly larger, just to provide clearance for the end of the boring bar when boring the wheels. Finish the surface of the bore smooth. Nothing has to fit into the hole, but if this jig is ever removed from the faceplate and then has to be replaced, it is this bore that must be recentred and it is absolutely crucial that the recentring be accurate.

You should plan so that you don't remove jig #1 until all work with the wheels and jigs is finished because it is tedious having to replace it to the high tolerance that is required for quartering. In any case, good planning ought to make it unnecessary.

Place the first wheel on the jig. Clamp it with the stub axle nut. Rotate the wheel to centre the line scribed on the wheelface and proceed to bore the crankpin hole for a press fit (½" to ¾" thou. interference). Bore it according to whether it is a driver or a coupled wheel. A balance weight may be needed.

Repeat for all driving and coupled wheels.

In the case of jig #3, bore it a close clearance fit, that is, about 1-2 thou. larger than the driver crankpin diameter (⅝" in my case).

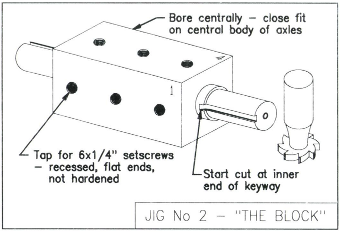
Press the crankpins into all the wheels. Jig #3 doesn't have a crankpin. Don't bother with Loctite unless you have made the fit too loose for a press fit. In this case if it is a driver, it is recommended that you also fit a small ⅛" key to the crankpin, but I wont detail this. This finishes the work on jig #1.

#2 - The axle jig

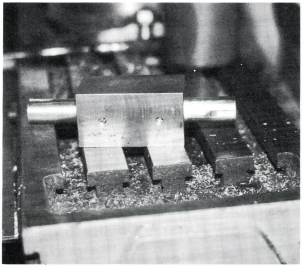
This jig is a square sectioned block. This holds the axles for milling the keyways at each end so they are precisely at right angles to each other. The block is a piece of BMS 1.5" to 2" square and approximately 3" long. Centre it approximately and rough drill a ½" hole right through in the centre.

Remove it and drill and tap six holes, three in each of two adjacent sides of the block for ¼"W or M6 mild steel flat-ended grub screws. These are used to lock the axles without marking them and six are used so individual screws don't have to be tightened up hard. The ends should be turned down slightly for about a sixteenth (2mm) so that if they spread the screw won't seize up. The screw heads *must* lie below the surface.

Centre it again, very accurately this time. Face the ends, and bore it *accurately* through for a gentle push fit on the axles. Check the finished bore for parallellism by putting the block on a surface plate with a piece of axle


Bore centrally – close fit on central body of axles
4
1
0
Tap for 6x1/4" setscrews – recessed, flat ends, not hardened
Start cut at inner end of keyway

JIG No 2 – "THE BLOCK"



Jig #2 with an axle in it which had been milled

through it resting on matching V-blocks. If not exactly true, mill or surface grind the faces back to truth on all four sides using a good angle plate to square the first pair of adjacent sides. The other two sides are milled parallel to the first two.

Stamp what you consider the best side, number "1" towards the upper RH corner of the face. Then holding the block with this end uppermost, start numbering *anticlockwise* looking down on that end, stamping these sides 2, 3 and 4 in order. File off any embossing this produces.

Note that this jig holds the axles by their central body (journal) section. Therefore they can have any diameter ends with shoulders for locating into the wheels. The operation of the jig is independent of the diameter of the ends. My axles had no shoulders so to locate the wheels they were pre-cut to exact length and the wheels just pushed on until flush. Non-shouldered axles should *not* be used with lesser systems of fastening. Wheels fastened with Loctite or with scotch keys can "work" down along the axle until they eventually come off. So use this system only with good press fits and with keys.

Most designs do specify shouldered axles. Maybe for this reason as well as accurate back-to-back.

It is the end diameter that is always the reference to locate everything on the jigs so the user should bore holes designated as "axle" in the jigs according to this end diameter.

Set the machine vice on the milling machine parallel with the table and on the left of the tool head. A so-called precision machine vise with ground faces will set work true in the horizontal plane automatically and save an enormous amount of time and work.

The axles should be cut to length with the ends squared. The centre-drilling can be done now or later. Scribe one piece of axle with accurate cross lines to define its centre. Put this piece in the block, locking it in place with two grub screws.

Set a height gauge or surface gauge to the axle centre. Transfer the height to a tooth on the cutter and set and lock the cutter height so the pointer bisects the tooth. Once set, and locked up tight, do all the axles in the one session. If you do decide that you do not like the first one, don't try to alter it. Move the axle around 45 degrees and start again. The first slot will have to be filled as best you can. In fact this is so important, that if the cutter height changes for any reason during the cutting of the axles or if one slips in the jig half way through, the whole set of axles must be considered ruined. You might argue, cut the ends down and use them for some other loco, but then you cannot use these jigs for the quartering and keying. So reusing them on a different engine is simply not worth it.

Keyway cutting using a Woodruff cutter

⅛" Woodruff cutters are usually ½" diameter and 3/16" cutters are ¾, ⅞" or 1" diameter - the smaller the diameter here the better because the run-out curve is shorter.

Lock axle No 1 in the block and in the vise with side #1 facing you. Start the cut with the Woodruff cutter close to the block so it cuts towards towards the right, to the end of the axle. In other words, it must not cut in "climb feed" mode.

Cut to 1/16" depth + 15 thou by measuring the overall width of the axle at the bottom of the cut with a vernier (.687" here). This is not a critical dimension. Change the base dimensions to suit your own job.

The length of the keyway must be about equal to the thickness of the wheels. Note that the key itself must not project on the inside where it would foul the axle boxes, and that it should be flush with the wheel face on the outside. So the keys will later be made shorter than the thickness of the wheels and will have to be tapered underneath to match the runout curve (if there is one). ⅛" keyways are best cut by Woodruff cutter, however 3/16" keyways, especially in shouldered wheels, are probably best cut with a slot drill.

Keyway cutting by slot drill

It's common practice to use a slot drill to cut keyways. This method has the advantage of having no runout at the end and no curved bottom, albeit there is a round end. Do not use endmills, they have a tendency to cut oversize.

It is somewhat more difficult to cut a straight clean slot to exact width this way than with a Woodruff cutter. The reason is that the width depends on the accuracy of centring of the cutter and to some extent on its sharpness. ⅛" is also a very fragile cutter. 3/16" width is a better proposition for slot drilling. Please yourself which method you use.

Keysteel

It's best to use proper keysteel rather than standard square BMS which is unlikely to be a tight fit. Keysteel is usually zinc plated and a few thou. over nominal size, but you should measure it with a micrometer before you buy as I have seen everything from 5 thou. over to zero over. You probably should aim for about 2 thou. oversize because the Woodruff cutter will cut about +1 - 0, depending on the quality of the alignment, and therefore the key needs a thou. or two more to be tight. Slot drill cuts will vary too much to generalise.

Which side leads?

Now to cut the other end. If your motion gear is *right side leading* which is probably the commonest type, remove the block from the vise and turn it end for end. Assuming you numbered the block faces as above, rotate it and replace it in the vise so that side #2 is now facing you. If your motion gear is *left side leading* then replace the block with side #4 facing you.

Repeat the cutting as for the first end.

Repeat these steps for all axles.

N.B. Always use the same block faces in the same order for each axle, because this means that any tiny residual error in the block is repeated in all the axles identically. The absolute size of any error is irrelevant. What matters is that they are all the same.

Don't under any circumstances, move the axle in the block between doing the two ends.

It's not all that important which side leads except to honour a prototype. Obviously you *must not* mix them on a particular loco. That is, you will use side 1 with *either* side 2 *or* with side 4, never a mixture of the two!

Woodruff keys

I haven't yet mentioned using Woodruff keys specifically. They are very effective and relatively easy to use. The only problem is that they do not show a key on the outside of the axle and this is not kosher for any prototype nor does it look right to see an empty keyway in the wheel hub and no matching keyway in the axle. It's possible to dummy it up but why bother when the real thing is no extra work?

However where looks do not matter, I would happily use a Woodruff key anytime. The only hard bit about using them is getting the slot depth right. The keys are squeezed into the round-bottomed slot with a vise before pushing the wheels on but I always seem to underestimate the depth of slot required, and they can be very tight - too tight sometimes so you may have to thin them on some carborundum paper first.

This finishes the work on the axles

A note about quartered axles

An axle which has been quartered has no defined left or right end, the ends are interchangeable. But the side that is going to lead *is fixed one way or the other* by which adjacent quadrants the keyways occupy, and this wont change however the axle is assembled.

A note on centre drilling

Collets greatly simplify the centre drilling of the ends. Otherwise each end must be centred individually in the four jaw chuck to better than a thou tolerance. Self-centring chucks are not sufficiently accurate for this job.

Centre-drilling shafts without collets

A technique that avoids the hassle of using the 4-jaw chuck to centre axles when a collet is not available, is:-

1. Clean and re-oil the lathe bedways and polish the tips of the steady rest jaws.

2. Move the saddle out of the way to the right and install the steady on the lathe bed to its left

3. If it is an unshouldered axle, grip it in the self-centering chuck to the full depth of the jaws. If it is shouldered then find a piece of clean round stock the same diameter as the end and grip this in the chuck

4. Slide the steady rest up close to the chuck jaws around the axle. Tighten the bed clamp and lock the hinged arm down tight

5. Snug the three jaws up to the shaft until they just start to pinch. Tighten the locknuts on the two lower jaws adjusting the screws.

6. Slacken the bedway clamp and slide the steady to the outer end of the axle out of the way for the moment.

7. Release the chuck jaws and insert the axle so that no more than 1/2" is held by the jaws.

8. Move the steady back until it is around the last half inch of the axle.

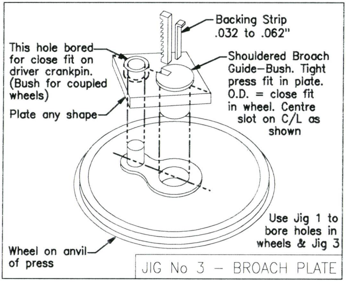
9. Readjust the top jaw to provide support without marking the surface. It should require only minute adjustment, and the end should remain correctly centred.

10. Centre-drill the axle with the tailstock extended to reach over the carriage. If the drill is started carefully it will actually find true centre even if the jaws are slightly out. What happens is that the point drifts so as to minimise any displacement, but only to the extent that available play in the tailstock ram allows it. If the error exceeds the play then the drill breaks. (So you resolve to take more care next time, or you trot out and buy a set of collets, plus a new centre drill.)

11. Remove the axle by loosening the chuck jaws, passing it up into the chuck to take it clear of the steady rest. Don't undo the hinged arm unless absolutely necessary, and disturb the steady as little as possible. Insert another axle in the reverse way in which the previous one was removed. Repeat steps 6, 7, 8, 9, 10 to do all ends of all axles

#3 - The broaching jig

This jig locates the keyway in the wheel exactly in relation to the crankpin and what is most important, identically in all wheels. The crankpin hole in this jig itself, *must* be bored using the crankpin jig (#1)


Backing Strip
.032 to .062"
This hole bored for close fit on driver crankpin. (Bush for coupled wheels)
Shouldered Broach Guide-Bush. Tight press fit in plate. O.D. = close fit in wheel. Centre slot on C/L as shown
Plate any shape
Use Jig 1 to bore holes in wheels & Jig 3
Wheel on anvil of press

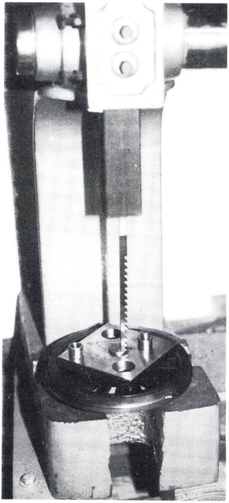
JIG No 3 – BROACH PLATE

The axle hole in it should ideally have been done while doing the wheel axle bores.

It is made from any old piece of 3/8" steel plate or bar about 4" to 6" round, square or even irregular, but it must be flat, and clean on both faces. It must be small enough to be swung on the faceplate in jig #1 and it must have faces larger than the hub of the wheels and crankpins. I used a piece of 4" square plate that had been surface ground for something else. This made a very nice jig.

Mark it out accurately with the axle centre and the crankpin centre and scribe a line right across joining the two. Jig #1 is always the final arbiter of crankpin radius distance if individual markings don't match. It is the radial line that is important here.

Bore an axle hole as for the wheels, ie with an interference fit if not already done. We will be fitting a stub axle which doubles as the broach guide bush in this bore.



Jig #3 in use with a wheel in place. Note (a) crankpin projecting through hole in jig (b) reducing bush lying on plate and (c) raising blocks under press

Attach the jigplate to the faceplate on top of jig #1 and bore the crankpin hole (jig #1 should still be on the faceplate). But this time it must be bored for a gentle push fit for the larger (driver) crankpin diameter (5/8" here), or ream it to finished size if that is possible. The coupled wheel crankpins will be bushed later to bring them up to this same diameter.

Remove the jig plate from the faceplate.

The stub dummy axle doubles as a broach guide. Make it out of slightly larger diameter steel (7/8" here) in order to leave a shoulder on it. This shoulder is necessary to stop the guide getting pushed out of the jig plate. The alternative to a shoulder and press fit, is to weld or Loctite it into the plate. Either way it *must* hold tight. If it moves before all the wheels in the set are broached, the whole set is ruined. The only way you could salvage them would be to make a new guide with a wider slot (eg. 1/4"), fix it in properly, and then run the wider broach through the whole set. It would also mean cutting the same width keyways in the axles by replacing them in jig #2 and roughly centring the new keyway over the old one, over-cutting it to the wider dimension.

So turn the part of the stub that will go into the jig plate to a press fit in that hole. Turn the rest to a gentle push fit (a close clearance fit) in the wheel axle holes.

Before parting it off from the bar, cut a keyway in the stub with the Woodruff cutter the full length past the shoulder and to a depth slightly greater than the depth of the broach at its thinner end.

Finally cut it off to length such that it will be flush with the bottom of the wheel, or it can be longer if there is enough room under the anvil. That is, it will be a *minimum* of the thickness of the wheels plus the thickness of the jig plate, plus the thickness of the shoulder.

While this guide could also be used for broaching other parts with a 3/4" bore if it is pushed out of the plate again, if you remove it you will never be able to match the exact position again and never be able to reproduce an identical match to this set of quartered wheels. Guide bushes are not that difficult to make and I would recommend making a new one if the need ever arises.

Press the guide into the plate with the slot centred as close as possible over the line joining the two centres. It must be tight enough not to move or twist under all the stresses of use. You can optionally cut a shallow keyway in the plate with this guide or another one, to act as a guide when pressing the stub itself into the plate. I found that it was easiest to line up the guide by putting a piece of key out at right angles in its slot and using that to bisect the crankpin hole by eye. Try each method and use the one that you like best. Press the guide bush cum stub axle in tight.

If not already done, cut a ⅛" keyway in the jig plate with the new guide and just deeper than the deepest keyway you will ever need. We do this now because broaching steel is a job on its own. If intending to use a 3⁄16" broach in this jig, run that broach through too. It will be easier for having been started with a ⅛" keyway.

Whichever way it's done, aligning the guide keyway to the line joining the two holes is an operation that is not going to be exact, so let's analyse the effect of an error of, say, 1degree to left of 90 degrees.

All the wheels on one side will be one degree ahead, but equally so. Thus there's not going to be any difficulty with coupling rods.

The wheels on the other side are effectively "turned over" mirror image, so the error for them is one degree to the right of 90 degrees. But again they are all the same so there's still no problem. However the two sides are now twice the initial offset apart from each other even though centred around the 90 degrees.

Does this matter?

The answer is *no* — provided the total error is only a matter of a few degrees. A large difference would give rise to an asymmetrical beat. Starting off, the loco would not be affected until the difference became quite large. Nevertheless it is clearly desirable for cosmetic reasons that the error be kept small.

If only doing one set of wheels this broach guide bush can be made of M.S. but use silver steel or maybe even case harden the bottom of the slot if intending to do production work. It would be possible to adapt it for interchangeable guide sizes by adding an extra fixed bush in the plate and arranging for the guide itself to be a removable part fitted and locked in this fixed bush by some means, probably another keyway. I haven't done this and don't recommend it because it is too easy to introduce play and error.

Broaching of the wheels.

To use jig #3, put a wheel on the anvil of the press. Put the jig plate over it with the two pins engaging their respective holes. It can only go one way. Clamping to the anvil is not necessary. If a firm fit, simply press them together. They can be separated easily later with two screwdrivers used as levers on each side between the two parts.

Put the broach into the slot in the guide and ensure it is over the hole in the anvil. Make sure it stands vertical and central under the ram, and push it through. If the broach is designed to cut 1/32" per pass (about two thou per tooth) then make a second pass with a 1⁄32" M.S. spacer strip in the slot behind the broach.

Note that all the wheels are broached the same way. In other words, do *not* try to "turn over" the left hand set in relation to the right hand set. In fact it isn't possible. Certainly, one side is going to be turned over relative to the other when they are mounted on the axles but this doesn't matter, as has been argued above.

Therefore the wheels are all interchangeable and there is no left/right orientation. This is a significant advantage in quite a few ways.

#4 - The reducing bush

This bush builds up the diameter of the smaller coupled wheel crankpins to that of the driver so that coupled wheels can be positioned accurately in jig #3 for broaching. So it is required only for coupled wheels and only if they have smaller diameter crankpins.

Summary of holes and fits in various parts

They are all quite logical but they could become confusing so lets just get the definitions right first:

- Clearance fit means a "close free" or, if you like, a gentle push fit.
- Interference fits means a press fit with an arbor press and about 1 thou. per inch of diameter of interference with a smoothly finished bore.

I have summarised all the fits and they are as follows:-

- Wheels to axles = interference fit + keyed.
- Wheels to crankpins = interference fit. They are not keyed normally (but if a driver and it requires Loctite because of loose fit, then it is prudent to be keyed.
- Jig #1 to axle hole = interference fit on part of the length of stub axle going into plate.
- Jig #1 to crankpin hole = any size just bigger than the crankpin size but finished with a smooth bore.
- Jig #1 to stub axle = nominal full axle diameter for interference fit on part going into plate.
- Jig #1 to all else = a clearance fit for the axle holes of the wheels.
- Jig #2 to axle journals = clearance fit.
- Jig #3 to hole for stub axle = interference fit.
- Jig #3 to stub axle/guide bush = interference fit for hole in plate.
- Jig #3 to projecting part = clearance fit in the axle holes of the wheels.
- Jig #3 to crankpin hole = clearance fit for the bush (qv) and for the driver crank pin.
- Crankpin bush inside diameter to coupled wheel crankpin = clearance fit.
- Crankpin bush outside diameter = a clearance fit in Jig #3 (for driver crankpin).

Assembly

That concludes the making of the jigs and the parts themselves. The key steel should be tested for a proper fit before trying to assemble the wheels on the axles. I have described the 3⁄16" keyways as being 3⁄16" x ⅛" thick so if using these same dimensions, the 3⁄16" keysteel would have to be machined down to ⅛" thickness first. You may wish to use 3⁄32" or even 3⁄16" thick keys. That is optional.

A long piece of very slightly narrow keystock should be put in the slots to align wheels with axles during the pressing (parts often twist during pressing). It can be pulled out later to drive in the final key to a proper fit and so that it is flush with the outside face of the wheel.

If using Woodruff-cut keyways, the keys will also have to be tapered on the underside at the inner ends to allow for the runout curve. This makes it necessary to tap the key back after every ⅛" of pressing so it doesn't lock up on the taper.

Alternatively, and best, you could pin the key into the axle in advance with a small 1⁄16" silver steel pin. Drill a 1⁄16" hole through the centre of the key into the axle for about ¼". Drive the pin into the hole and file off flush on top. This isn't necessary with keys constrained by square ended keyways as cut by slot drills.

Note that keys must be quite tight from side to side but a free fit from top to bottom.

Two warnings

- If using non-split axle boxes, do not forget to put the axle boxes on the axles before driving them into the wheels!
- Remember that coupled wheel axles may not be the same length as driver axles. They could well be a fraction shorter. If so, do not mix them up.

Optional

The reader will have come to notice that jig #1 and jig #3 differ only in that the stub axle in #3 is slotted to make it into a broach guide. There is no particular reason why they cannot be combined, except that it must be taken off the faceplate for the broaching step. I preferred to make them two separate parts and in fact I even made an auxiliary faceplate of ½" plate to hold jig #1 semi-permanently. It is still there years later. The other faceplate was used for the cylinder blocks. That's optional.

Restrictions

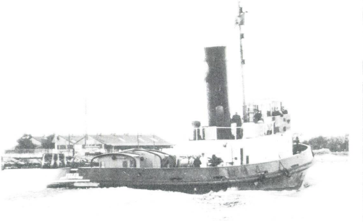
Jigs #1 and #3 are specific for a particular

.... *(Continued on page 52)*

Steam Tug *Yelta*

story and photos by Dennis Collings

Data and additional assistance from Commander E R.Holme.



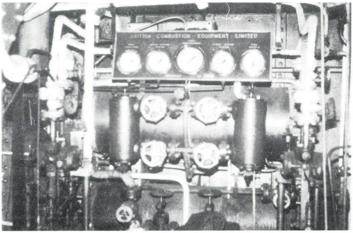


Photo 3

A brief look at Adelaide's historic steam tug (above) and its initial steam trials after restoration

The steam tug *Yelta* (displacement 280 tons) was constructed in 1949 at Sydney's Cockatoo Island Dockyard. She was laid up in 1976 after 27 years in service in Port Adelaide.

On her steam trials in 1949 the maximum indicated horse power developed was 970 with a mean of 925. The steam pressure at the high pressure stop valve being 192 psi, giving a maximum of 148.7 revs/min with a mean of 146.7 revs/min.This gave her a speed of 12 knots.

Yelta was purchased by the South Australian Maritime Museum in 1984, and restoration has been taking place ever since by volunteers, many of whom are retired. The overhauling of the machinery has been undertaken by ex-merchant navy, R.A.N. personnal, and other enthusiasts of many trades, all working under the overall guidance of retired Chief Engineers (M.N. and R.A.N.).

Working closely with the Department of Marine and Harbours surveyors, the restoration had reached the stage of steam testing and setting the safety valves by mid 1989.

Technical information

Boiler: Scotch Wet Back type 16½ ft diameter by 11 ft 2 inches long, and is oil fired in three furnaces. Safety valves open at 207-210 lb per sq inch. The boiler will hold some twenty tons of water at normal water level. (**photo 2**)

The fuel oil combustion unit (**photo 3**) is by British Combustion Engineering and comprises two G & J Weir steam driven reciprocating pumps, two horizontal oil heaters and suction/discharge filters. Normal oil pressure/temperature is 150 psi at 200 ° F.

Main Engine: Triple expansion. Cylinder diameters are — high pressure 15", mid pressure 21" and low pressure 40". Stroke is 27". dia. Engine is rated at 970 hp at 149 revs/min. L.P. cylinder steam exhausts into the Condenser. The piston and valve rod packing is of the United States Metallic type.

Valves and Valve Gear: Anderson Cameron or Matchbox slide valves.Valve rods are 2½" dia. Stephenson's valve gear, worked by steam reversing gear, and by hydraulic pump when not in steam.(**photo 5**)

Engine-driven Auxiliaries: Two boiler feed pumps, two bilge pumps, and the air pump to maintain a vacuum in the condenser. All driven by rocking levers from the low pressure cross head.

Condenser : The condenser contains 179 tubes (1076 sq.ft.) (**photo 6**)

Auxiliary Machinery: A single cylinder steam engine drives the condenser cold water circulation pump. There are two single cylinder Weir Pumps, one for boiler feed and one general service pump (fire fighting, ship trim, deck cleaning.). Auxiliary steam is supplied through a pressure relief valve at 100 psi. Two single cylinder diesel generators, one 240V ac 15amp and one 110V dc 15 amp.

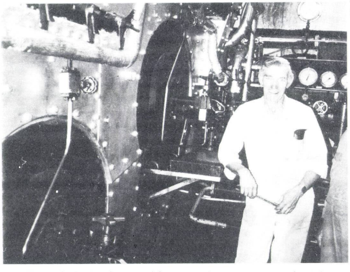


Photo 2 *Boiler front and furnaces, burner near man's right shoulder and gauges on oil combustion unit in background*

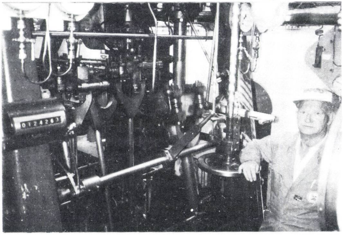


Photo 4 *shows the author at the telegraph engineers station main stop valve*

The Steering Engine: The tiller flat is in the aft part of the engine room, and contains a two cylinder steam steering engine supplied by Donkin Ltd. and is controlled from the wheel house by rods and gears. Emergency operation is by handwheel via a dog clutch to isolate the steering engine.The propeller shaft is in three sections, a short length supported by the thrust block, an intermediate length suported by a plummer block and finally, the tail shaft, to which is fitted a four bladed cast iron propeller 8 ft. 9 in. diameter.

The total weight of machinery with steam up is approximately one hundred forty five tons.

Raising steam

When raising steam from cold, diesel fuel is used. It is drawn from a 400 gallon tank by a small electric motor driving a geared pump. When first lighting up, the centre furnace is lit using the smallest size burner tip. Each half hour the two wing furnaces are also alternately fired for 15 minutes till all air as been expelled from the boiler. Then leaving the centre furnace on, the wing furnaces are fired half hour at a time until a steam pressure of 60-70 psi. has been reached. Up to this time only natural draught has been available to assist combustion. Steam is now admitted to the force draught fan, to one fuel oil pump and to one fuel oil tank heater. When the oil temperature has reached at least 160° F the change to fuel oil firing can be made. Pressure can be raised as required. It takes some six hours to clear air from the boiler and a further twelve hours or so to get a full head of steam.

Approximately two hundred gallons of diesel fuel are needed to raise the pressure to 60 psi. Warming the the engine through from cold takes up to two hours or more, this being accomplished by admitting steam at a few pounds pressure to the high pressure inlet valve, allowing the steam to work its way through to the low pressure cylinder then into the condenser. Before doing so the cold water circulating pump must be running to allow exhaust steam to condense.

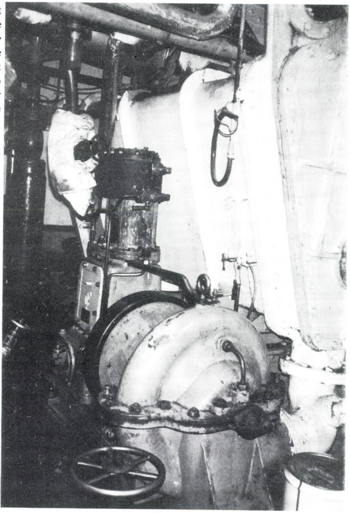


Photo 6

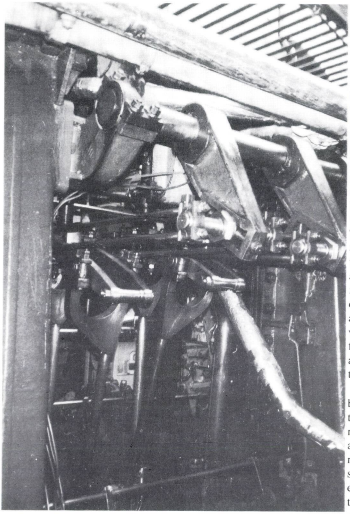


Photo 5

All cylinder drains are open during the warming up process as there is a considerable amount of condensation during this period. The hand operated steam/hydraulic reversing gear is moved more or less continuously during the warm up procedure. This allows steam to the ahead and astern parts of the engine alternately and shortens the warming up process. As the engine tends to warm up and becomes 'easier' it will turn the crankshaft further as it gets to the ahead and astern position.

The engineer has to be careful not to allow the crankshaft turn too many revolutions in case a strain is put on the mooring ropes. At the same time as the main engine is being warmed through, the steering engine should also be warming through. It is put to port and to starboard, checking by voice pipe that the midship indicators on the steering wheel in the wheelhouse, and steering engine coincide. The wheel house, and engine room telegraphs are checked at the same time. All is ready when standby engines is rung down on the telegraph.

Steam trials — 27 June 1989

For two weeks before the trial, a great deal of checking of the main engines, steam auxiliaries, pumps and condenser, the many valves and steam, fresh water and sea water lines was undertaken, all in the cold state. So it was with a little trepidation the boiler was filled leaving just a little room in the water gauge to allow for expansion. Then the light-up procedure, as already described began.

All actions and times are entered in the boiler room and engine room rough log books. The boiler had not been in steam for thirteen years, so this operation was taken very slowly over 24 hours so as not to cause any strain to boiler shell or furnaces. When 70 psi. was reached, the steam fan engine was started to increase the flow of air through the furnaces. The Weir steam pumps were then started to pump fuel oil to the burners. These pumps failed after a short time, one with a bad gland blow and the slide valve on the other was set incorrectly and kept stopping. The boiler had to be shut down and repairs to the pumps were then completed.

On the next try the fuel pumps worked well. The pressure climbed to over 100 psi. One look at the funnel showed we were giving off a smoke screen. This was traced to a jet in one burner and an open panel in the forced draught. This was soon cured by the boiler room staff. The next trouble encountered was with the Weir boiler feed pump in the engine room. The valve and shuttle bobbin had to be resurfaced and a new gland bush made. As the time was getting short before the trial date, the steam left in the boiler was used to test the steam condenser circulation pump, general services pump, steering engine and anchor winch. All passed with no trouble at all.

The week before the trial run steam was raised again. At 100 psi the Weir feed pump, now repaired worked well and pumped the boiler level to three quarters of the gauge glass. A phone call was made to the Harbour Board for their boiler inspector to witness the setting of the safety valves.(Same test we use to test our model locos only with a lot more noise.) Safety valves were set (200-207 psi) and time to test the main engine after seventeen years! The job was to slowly heat the engine through with the bleed valves, open all drain cocks, (condensation drips down every where), double check that the hand turning gear is out, fill all oil boxes, and check all the wicks; start steam circulation pump to cool the condenser with sea water to start creating a vacuum.

The first check was the reversing gear which is steam operated (hydraulic when engine is cold). The first time it moved with a mighty shuddering over the links. Many applications of oil on the links and many moves from full ahead to full astern soon cured this trouble. The ship could be manoeuvred with confidence. Now to open the main steam valve — half open and no movement! One more turn, a mighty chuff and we had our first revolution. We could only do few revolutions each way so as not to strain the mooring ropes....but we were ready for Yelta's steam trials!

June 27th was a nice day with little wind and no rain. When I arrived at the tug there was a ribbon of steam from the safety valve pipe and a slight smoke haze from the funnel. The boiler room had a full head of steam. We spent the morning oiling and checking everything twice over. At noon the captain came aboard with his chief engineer to take over control of the tug for the trial. Mrs Biggins, widow of Max Biggins (who started the restoration work) blew the first blast on the ship's siren.(Long speeches, cool day, much condensation in siren = quick shower for V.I.P's and a happy start to the day for crew!) Mrs Marsden, widow of Mr H Marsden (who restored the wheel house) rang "stand-by engines" on the engine room telegraph.

Just after 1 pm the mooring ropes were cast off and the captain rang for slow astern out into the Port River. A few more orders on the engine room telegraph and the tug was heading up river at five knots with the steady thump of the main engines. I went into the engine space past the clanking steering engine, and the low pressure cylinder of the main engine, down the ladder to the engine room plates. The large connecting rods were flashing up and down, the valve gear gently rocking and the large beams rocking off the low pressure crosshead, driving the bilge, feed water and air pumps to maintain condenser vacuum. The captain asked for 80-90 revolutions (approximately 7 knots). That large crankshaft was really turning now with its 13½" throws, the massive crossheads turning the oil into white foam. The boiler room asked for more feed water but on the opening the steam valve, the Weir pump began to vibrate badly. The second engineer gave me a mop and a can of oil to lubricate the pump piston rod while he checked valves on the feed water lines. All was OK! One valve half closed giving back pressure on the feed pump.

The revolutions built up to over hundred near 8 knots. The bilge pumps began to heat up with not enough water circulating through them. A cold water spray soon corrected that. The steam pressure started to drop (much swearing from the boiler room ... Bill's on the war path ... too many revs for No. 3 burner jets). Larger burner jets fitted and steam pressure begins to rise. Revolutions go up, everyone happy, then some one opened up the steam valve on the fan engine and blew out all Bill's burners! Bill's swearing generated so much heat the steam pressure hardly dropped!

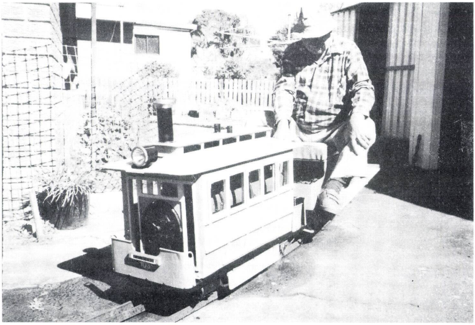
We made a quick turn round at Outer Harbour, a good steady pace and no trouble on the trip back to Queens Wharf. Mooring ropes were looped on quay bollards, gang plank ashore and Captain rang 'finish with engines' at 2:30pm. Everyone was satisfied with our first trial.

In 1994 the diesel dc. generator was been taken out and the ship rewired for ac. The ac. diesel unit has been fitted with a larger generator. *Yelta* has made many trips on the Port River, one a few miles out to sea to escort the replica of Cook's *Endeavour.*

A Steam Tram in Ballina

by Keith Watson

Charlie Mead of Ballina, NSW enjoying a drive around his tramway with his 7¼" gauge model of a steam tram locomotive from the Parramatta Park Tramway in Sydney.

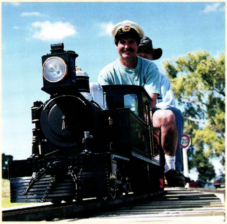


The tram loco has a copper boiler, 8" diameter, designed in accordance with the AMBSC copper boiler code, and operates at 100 psi. Cylinders are 1.875" bore and 2.75" stroke and valve gear is Stephenson's link motion, fitted inside the frames. The boiler is fed through two injectors.

This tram can negotiate 20 foot curves, and is ideal for someone wanting a loco to run around a railway ... oops! tramway on their property which requires sharp curves. This little loco took Charlie just eight months to design and construct. He also had many other locomotives to his credit. *(Shortly after this issue went to the printers I was informed that Charlie passed away last August. What better way to remember him than a photo of him doing what he liked best. Our thoughts go to his wife and those he leaves behind ... Ed)*

NZ International Model Expo 1998

report and photos by Charlie Lear



What better way to start an account of a great weekend than with a happy face...Barry O'Callahan of Maidstone at the controls of Graham Harris' single Fairlie

Introduction

Held every two years and alternating between the North and South Islands, the New Zealand International Model Expo is earning itself a place on the international model engineering calendar. This year, it was the turn of the Tauranga Model Marine and Engineering Club to host the event. Tauranga a busy seaport 200km southeast of Auckland, is the largest city in the Bay of Plenty and is home to many attractions including the Mount Maunganui surf beach, orchards, timber plantations and historical sites. Tauranga's warm climate and proximity to Auckland make it a popular holiday spot with the locals and this year school holidays and the Ironman event put accommodation at a premium during the Expo, with every motel full

Long before the event, word was that Tauranga was going to be something special. Les Moore, assisted by Chris and Paulette Morton, worked hard behind the scenes for over a year, and probably everyone going to the Expo had high expectations as a result. Very few realised just how good it was going to turn out!

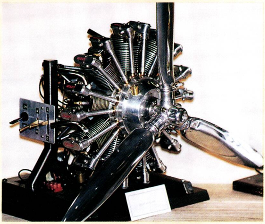
Over two hundred registrations were received from throughout New Zealand and around the world. Many participants brought family and friends with them. Over 7500 paying passengers rode the trains over five days, with over 2000 each on Saturday and Sunday, and at times it was hard to move around the station area. A party atmosphere prevailed and several thousand people also spent many happy hours wandering in the exhibition hall.

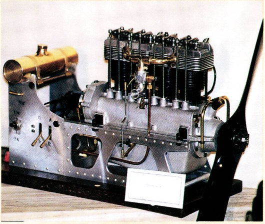
The Exhibition

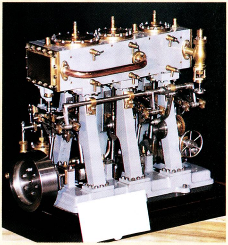
The exhibition, held in the 45 000 square foot hall at Memorial Park, was the largest yet seen in New Zealand. Most clubs throughout the country contributed items for the model engineering displays, including fifty locomotives and well over a hundred other items. The Palmerston North club had a separately manned stand which clearly showed the effort they had put in. Having seen the extent and quality of the displays, more clubs will no doubt want to support the event in future.

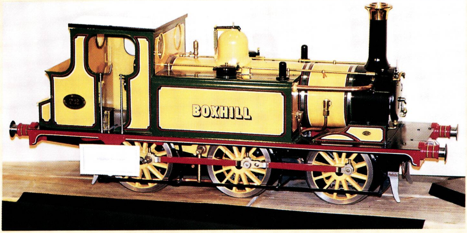
While primarily a model engineering showcase, ample space was given to other pursuits and the hall was filled with displays of plastic models, aircraft from the Tauranga Model Aircraft Club, boats from the NZ Model Powerboat Assn and affiliated clubs, castles in wood, magnificent wooden sailing ships, china, teddy bears, paintings, machine knitting, woodcarving and turning, and Meccano. The trade was represented by the Powertool Centre who did a roaring business all weekend. Unlike the *Model Engineer* exhibition with models competing for prizes in different categories, the Expo was a straight exhibition of models loaned for the occasion. Only one prize was on offer — the Canterbury Award, for the Best In Show, as chosen by invited judges.

There are far too many models to list individually, so I'll briefly cover my personal

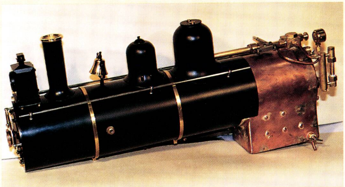




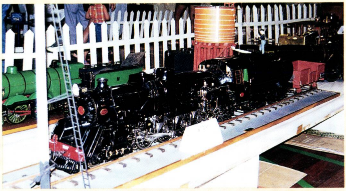




A collection of models were on loan from Auckland SME but unfortunately there were no details available. The models are all superb examples of the craft like this 5" Brighton Terrier Boxhill *(left). The other models are (above), from top a 9 cylinder working model of a Wright Whirlwind areo engine, a Cirrus Mk1 OHV four cylinder in line aero engine and a triple expansion marine engine. (Perhaps someone from Auckland can provide details...Ed)*



This 3/4" scale Pennsylvania A3 boiler by Graham Ross of Tauranga shows careful workmanship and great attention to detail



Bruce Fordyce's 1" scale NZR Ja 1267 is truly an exceptional model. Note the scale water tank and lower part of signal post.

highlights. Omission from these paragraphs or photos is no indication of lack of quality - merely lack of room in the magazine! My pick for best effort in a small space is a completed boiler for a Pennsylvania RR A3 class 0-4-0 switcher in ¾" scale, as designed by Kozo Hiraoka and serialised in *Live Steam*. Built to an excellent standard of workmanship by Graham Ross of Tauranga, this boiler is a little gem and no doubt the finished A3 will be a lovely machine.

Some superb internal combustion engines were on loan from Auckland but unfortunately they didn't have exhibition cards and I couldn't find anyone to tell me about them. I'll let the photos do the talking and hopefully can let you know more in due course.

Glen Christoffersen from the USA entered a nice little open column vertical steam engine. This engine has a novel crank linkage instead of a conventional crosshead and its motion is fascinating to watch while turning it over by hand. An excellently made and finished Quorn tool and cutter grinder was shown by John Treloar. The quality of this machine puts commercial units to shame!

A triple expansion engine by Bob Batcheler has an interesting history. It is a model of the 1000HP engine in ss *Kuttabul*, a ferry built in Newcastle in 1922 and which ran hourly commuter services on Sydney Harbour between Central Quay and Wilsons Point at twelve and a half knots. It was accidentally sunk by a Japanese midget submarine in Sydney Harbour on 31 May 1942. The Japanese torpedo was aimed at the destroyer *USS Chicago* but missed. Nineteen ratings on the *Kuttabul* were killed and the wheelhouse serves as a memorial at the RAN Garden Island basein Sydney.

How's this for a garden railway? That is an 'N' scale track around this 12" diameter ceramic garden plot!

Several models were on loan from Murray Lane of Auckland, ranging from his 1⁄16" bore and stroke oscillating engine with thimble boiler, made in just 20 hours back in 1979, to his split crankcase for a Gnome 18-cylinder aero engine.

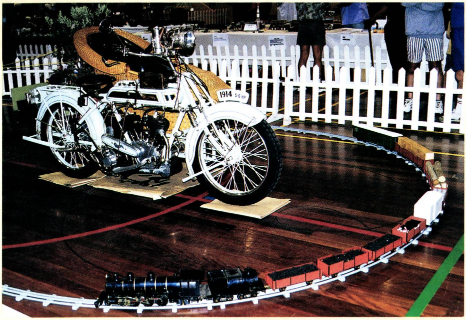
A group of four I/C engines were provided by John Moran of New Plymouth. All are working models and are as described in *Model Engineer*. Finished models are *Wyvern*, a 1⅛" bore x 2" stroke 40cc gas engine designed by Edgar T. Westbury; *Otter*, a 1⅛ x 1" 15cc OHV petrol engine by LVR Haydock; *Wallaby*, a 30cc OHV twin 1" x 1⅛" by ETW; and a part-built *Sea Lion* 4cyl ⅞" x ¾" OHC engine of 30cc, again by ETW. Creditable jobs which represent a lot of effort by John.

Des Morgan had two steam engines on show, I was particularly taken with his compound pumping engine. This is an accurate scale model of the pumphouse machinery installed at the Queen of Beauty gold mine in Thames at the end of last century. Not only is it a fine model in its own right, but it provides a valuable historical record.

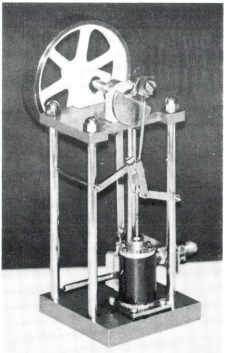
Across the aisle from the model engineering exhibits was a string of tables with nearly 300 plastic models by Michael Pilkington of Waihi. While some people turn their nose up at kitsets, such a collection still represents thousands of hours of skilled effort to create and Michael could teach many modellers a lot about painting and finishing. The overall effect, especially with the many detailed dioramas, was great.

The Palmerston North MES stand had many fine models. A fine 7¼" gauge model of W192, the first loco built by NZGR, is in the first stages of construction and already shows the care and attention to detail which typifies outstanding models. The late Barry Percival's unfinished 1½" scale Baldwin of the Wellington and Manawatu Railway Company was also shown. I hope that it can be completed with the same workmanship shown by Barry.

Bruce Geange had several high quality models on the stand and one in front, a 4" scale working International Farmall "A" tractor, using a Briggs and Stratton engine with a three-speed reversing gearbox. My daughter



Norm Dickey of Tauranga runs 1/2" scale gauge 1 models of NZR trains on 24V 3-rail track. The motor cycle is a 1914 Clyno with side-car rig.



Glen Christoffersen of Redwood City, California built this 1/2" bore by 1" stroke engine to an Elmer Verburg design...no crosshead or guide bars

fell in love with it and wanted to have a drive! Down the aisle were several more locomotives on a low-level display, including Bruce Fordyce's winners (discussed later). Taking up the stage end of the hall were many fine boats, yachts and radio-controlled aircraft.

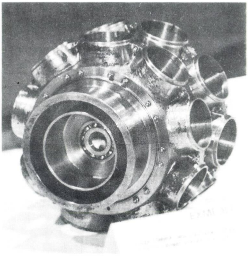
I had a great time wandering around, and in total I spent around twelve hours in the exhibition hall. Overall, the balance between model engineering and other interests was spot on. Everyone who attended would have found something of great interest, and of the dozens of people I spoke to over the event nobody had a single gripe about the entire exhibition. Knowing how hard it is to please a dozen modellers let alone hundreds, the success of Les Moore's organisational skills is obvious. What you didn't see was the many, many hours of hard work put in beforehand by Les and his team which guaranteed a smooth-running event. Well done!

I believe awards at exhibitions must be encouraged. The presentation of awards for models of significance should not be just to fill a mantlepiece but instead to provide builders of outstanding models the recognition and credit from fellow modellers that they so greatly deserve. The Canterbury Award is a good first step on that path.

Speaking to several people who have attended *Model Engineer* exhibitions it was evident they felt the model engineering content of the Expo matches that of recent ME shows. There is no doubt that many models on show at Tauranga would have been of Silver or Gold Medal standard at Olympia. Model engineers in Australia and New Zealand are certainly as good as any in the rest of the world!

The track

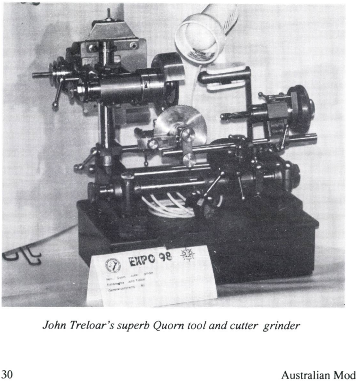
Tauranga's track is best described as ovals with pushed-in sides, running in the middle of a large park. Bordered on three sides by a large playground, Tauranga Harbour and a large flat field, the setting is both central to public facilities and picturesque. Trees are strategically located to provide shade and a playground is also constructed in the centre of the raised track beyond the storage tunnels. A large bridge is being built to link the two playgrounds.



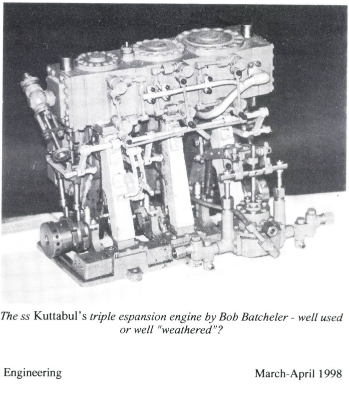
Murray Lane's split crankcase for a Gnome Monosoupape 18-cylinder aero engine. Made from cast steel, min. thickness 7mm, most was machined away leaving a strong shell. To date 100 hours on the crankcase and 1000 hours on the drawings

Let's have a driver's eye view of both tracks. On the **elevated** 2½" / 3½" / 5" gauge circuit, we leave the station and curve to the right, down a slight grade, through a tunnel, and around the outside of the new playground. Uphill now and we turn left, away from the tunnel and parallel to the station. A short straight is next, then back on the level to take a broad curve right, through 180 degrees to the straight at the station again. The smaller-gauge steaming bays and traverser are at this end of the station.

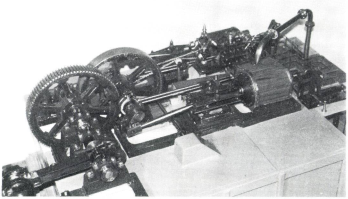
The **ground level** 5" and 7¼" track has an inner and outer loop, with storage sidings at the station. Passengers board on the outer loop at the station. Immediately the line curves slightly to the right, over a diamond crossing from which track leads from the inner loop to the large-gauge steaming bays. Straight now and heading away from the other tracks, we pass the tunnels on our right and head through small hills ("mullock heaps" someone said) toward the harbour. Curving right, with another small hill and trees on our right and the foreshore car park on our left, we rumble over the long curved wooden bridge and head back toward the station. Taking a wide curve left, we come to a trailing and facing pair of turnouts where the inner loop joins our track. The points can be set for the



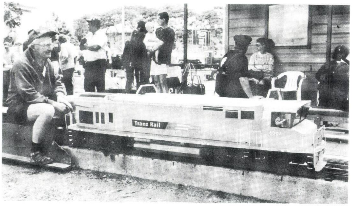
John Treloar's superb Quorn tool and cutter grinder



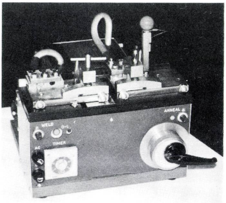
The ss Kuttabul's *triple espansion engine by Bob Batcheler - well used or well "weathered"?*



Des Morgan's lovely 3/8" scale model of the compound pumping engine and pump installed at the Thames gold mine in 1890



John Rappard brought his 1-1/2" scale DXR battery-electric loco from Dunedin.



A well finished and practical butt-welder for bandsaw blades by D W Simons

outer loop only, inner loop only, or if someone is there to operate the lever, cross to the inner loop. Just like a double slip only much simpler in dual gauge! Going through the trailing turnout we take the right-hand road on the facing turnout, to put us on the inner loop. The track curves to the right and into the station. Although this is a through road there is a 2mph speed restriction - all three tracks here are in use and there are plenty of people crossing the lines and boarding trains. Past the station we curve away, following the raised track and into another storage tunnel. Out the other side, we take a broader loop around the playground, with trees between us and the other tracks. Another large curve to the left takes us back to the turnouts. We take the left road this time which takes us on the outer loop, curving right and into the station straight where passengers are dropped off prior to rolling forward for more.

Thursday

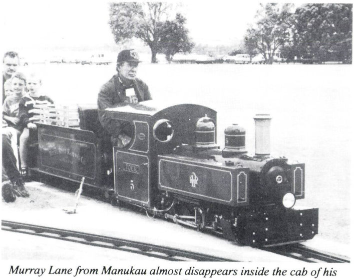
By ten o'clock when I picked up my registration pack the park was already buzzing, with many trains either on the track or getting up steam. A steady stream of new arrivals kept the registration caravan busy all day. I spent most of the afternoon in the exhibition hall, meeting people and taking notes.

The exhibition closed at five and shortly after John Heald and Paul Newton from Rotorua dropped off their 7¼" gauge NZR locos for display. These were rolled down planks from the back of a van to floor level and then on more planks to the display area. Fairly soon I was left alone to take photos. I had my amateur illusions of photography being a glamorous profession quickly shattered — it is hot, tiring work that demands great concentration. Once finished, I wandered down to the bar for a belated entry into the Beer'n'Lies session. By coincidence, I sat next to Tom Hulse from the Queensland SMEE. I'd been planning to meet Tom while I was in Brisbane in November but wasn't able to. I don't know how many lies were told but it was a great way to break the ice and set a relaxed mood for the rest of the weekend!

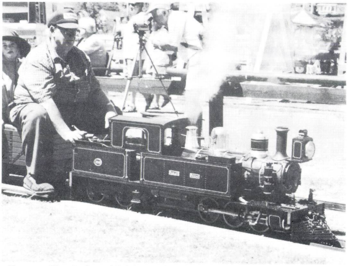
Friday

Everyone had been encouraged to attend the official opening of the Expo on Friday morning. There was a general air of expectancy all morning and the steaming bays were a hive of activity as a stream of locos were unloaded and steamed up. By eleven o'clock the station area was packed with three to four hundred people. Press, video and amateur photographers all jockeyed for position as Noel Pope, Mayor of Tauranga and Club Patron, gave a short speech. The ceremonial blue ribbon was cut and the event declared open, to loud applause. The Mayoral train, led by Graham McCarty driving Heidi, his 7¼" gauge 0-4-2, departed to lead a procession of no less than forty two trains. On the train were Mr Pope, his grandson Frank, Les Moore and Peter Jones of the Tauranga club. Both the Mayor and his grandson enjoyed the occasion immensely. The locomotive count by this stage included almost fifty on display in the hall, forty steam and twelve petrol or battery-electrics on the track.

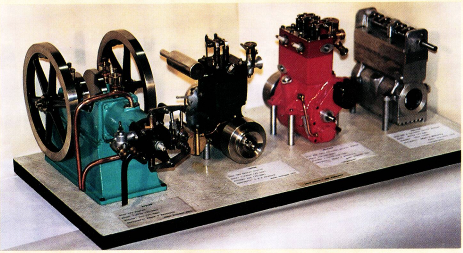
During the afternoon passengers constantly formed big queues for rides, starting a pattern that was to last all weekend. A night run had been planned but not many took advantage of



Murray Lane from Manukau almost disappears inside the cab of his freelance 2-8-0 Poem...*and*

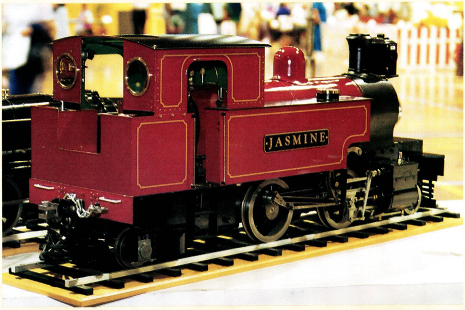


Graeme Harris from Maidstone had his pride and joy, single Fairlie in steam for the entire five days



The four I/C engines from John Moran of New Plymouth - (from left) Wyvern, Otter, Wallaby *and unfinished* Sea Lion

A view of p[art of the exhibition hall. In the foreground are kitset models by Michael Pilkington of Waihi - over 165 aircraft and 124 military vehicles. Behind can be seen some of the wooden sailing ships by C Wilde of Tauranga



Bruce Geange took over a 5"g. Ajax chassis and boiler which had languished in a cupboard for over 20 years. He lengthened the frames and tanks and fitted a new cab to make a freelance 2-4-2 version of a NZR 'L' class.

the opportunity due to a stiff breeze and falling temperatures. Towards dusk an approaching storm front closed in rapidly but a local said it wasn't anything to worry about. Fifteen minutes later men were being lifted off their feet as we struggled to bring down the tarpaulins that had provided shade over the station end. The wind grew stronger and small branches were being torn off trees yet the hardiest of drivers kept the trains rolling. Inside the station, twigs and tree seeds hitting the steel roof sounded like someone outside tossing stones. Real concerns were raised about the state of the tree near the end of the station. Contractors had already sawn off a large branch which broke earlier in the day. A small team shifted all the trolleys that had been parked on the grass underneath, struggling through the dust and blowing leaves.

Still the trains circulated but by nine o'clock only Graeme Harris from Maidstone was braving the elements, snorting at the "fair weather sailors" taking cover. I went on a few of the last runs. Holding tight to the trolley, wind roaring, smoke and cinders blowing horizontally away from the train, it was gloriously mad to be out there. I thought real hard about this when I was sitting with a cup of tea in the calm safety of the station later - nope, I definitely hadn't had as much fun in years. One of those moments when you know you are truly alive! Graeme packed it in at ten o'clock - his Fairlie a few minutes short of having been in steam and running for twelve hours straight.

One of the senior Tauranga members was consulted about the weather, after a tree had been reported blown over in the playground. "It'll blow out overnight and be fine tomorrow," he said. "The oracle has spoken!" people cried.

Saturday

Saturday dawned incredibly fine and clear, we were in for a scorcher. The oracle had indeed spoken! I picked up the photos taken on Thursday and Friday morning, and arranged a little album which I left on the table in the station. It got pretty well-thumbed over the weekend!

The park was fairly busy by mid morning, with the vintage machinery thumping away and a line of people watching a radio controlled yacht sailing in a temporary pool set up behind the station. I'm not really a boating fan, unlike my late father, but there is something uncannily intriguing about the way a model yacht stops and spins and turns in dead silence to almost imperceptible movements of the controls. Some further investigation is warranted here methinks!

After lunch I went back to the hall to retake some photos that hadn't turned out as well as I'd hoped, and had a good chat with some exhibitors. Amazing progress had been made on the woodcarving stand by a bloke chipping away at all the bits of wood that didn't look like dolphins. "I'd have finished it by now if I didn't keep talking to people - but that's what exhibitions are about." Indeed! Emerging into the sunshine I was staggered by the number of people milling around. There were easily more than a thousand at the exhibition and track. A gratifying sight indeed for the Tauranga boys, as of course you never know until the day if people are going to turn up.

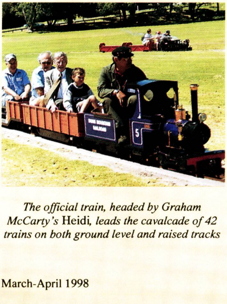
The rest of the afternoon passed pleasantly enough in the station and riding the occasional train. Bill Parker kindly let me drive his 5" gauge Hunslet *Holy War* so for two hours I circulated the raised track, getting burnt fingers and loving every minute of it. Around five, people started disappearing back to motels to get cleaned up and changed for dinner.

Saturday Dinner and Night Run

The Expo dinner and awards function was held at *Daniel's*, caterers for the entire event, located within Memorial Park. A packed house of over 125 attended, indulging in pre-dinner drinks, a hearty Kiwi buffet meal and the traditional trifle and pavlova dessert. Peter Jones, President of the Tauranga club, rose to the occasion and chaired the speeches and awards ceremony. Peter gave a stirring speech which emphasised the excellence of achievement present throughout our hobby and displayed for all to see in the exhibition and on the track.

Bottles of French wine were awarded to worthy recipients. Luckiest Person award went to Graeme Harris of Maidstone. One side of his loaded trailer's A-frame had fractured clean through near a weld, yet he arrived with everything intact after a 550km journey. Presentations were also made to people who had travelled from around the world to be at the Expo. Furthest travelled included John and Sheila Swarbrick, Alan Bibby and Roger Wright from the UK; Glen and Margret Christoffersen from California; and Tom Hulse and Don Norton from Australia. Farthest-travelled Kiwis were from Invercargill at the southern end of the South Island. A special Exhibitor's Choice wine award went to Murray Lane for his enigmatic smile.

It was time for the major awards and Dave Giles of Ikon Locomotive Works was called upon to present the **Ikon Cup** for the best locomotive to the 7¼" gauge 2-6-0 Phantom



The official train, headed by Graham McCarty's Heidi, *leads the cavalcade of 42 trains on both ground level and raised tracks*

The Canterbury Award and Bruce Fordyce

The Canterbury Society of Model Engineers generously made available a handsome gold-plated flywheel in a suitable case. **The Canterbury Award**, is presented to who is independently judged as having the premier model of the Expo. This year the judges chose Bruce Fordyce for his nearly-complete 1½" scale, 5" gauge model of *Livingstone*, a US built NZ Railways 2-4-4T.

The model is very brightly painted but the finish is as accurate as historical records allow. (Flash photography makes the wheels and cowcatcher appear much brighter than they are.) Bruce spent a great deal of time getting the exact shade of metallic grey for the boiler cleading, as very few people in the world now know what colour describes Russian Iron. Most estimates have it much bluer than grey, but the finish picks up colour from the surroundings, and it appears quite blue under a clear sky. Only minor jobs remain to be done on the loco, lile steam chest studs, painting the bunker and tanks, etc. Bruce estimates another six months to finish *Livingstone* properly. He is almost overwhelmed by his success. It's almost as if he doesn't think he's earned the award, but he certainly has!

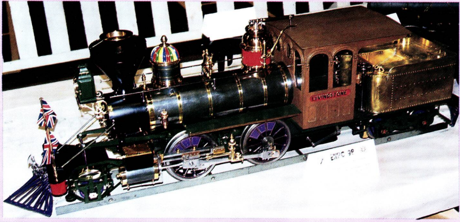
So how has Bruce arrived at the point where he can scoop the top award at New Zealand's biggest show? Starting with Hornby O-gauge trains when he was eleven or twelve, he didn't get into model engineering until much later in life, in his early forties. He's been a model engineer for thirty years and into live steam for twenty five. *Livingstone* is his third loco. First was a *Tich*, then he spent the next eight years building Ja 1267. The Ja, a 1" scale 3½" gauge exact scale model of an NZR 4-8-2 preserved at Te Awamutu, is a work of art and is one of the premier model locomotives ever built.

Bruce laughed as he reminisced about getting the keys to the loco shed and spending countless weekends in overalls slithering through oil, grease and dirt under the loco with tape measure and camera. He ran into difficulty getting drawings from NZR and had to use back door methods, with friends obtaining drawings and spiriting them to him. The the lack of clearances on the prototype meant that on the model, he had to work to very fine tolerances. There are a number of places on the model where clearances are only 1/128", but it all works.

Bruce proudly holds the Canterbury Award as club president Peter Jones looks on

One set of rod and valve gear drawings which Bruce obtained officially caused problems. He built everything to drawing and the front coupling rod fouled the slide bars. The drawing was for a plain bearing Ja (on a roller bearing loco the cylinder centre line is an inch further out from the frames). Fortunately the correct drawing had been rolled around the others to serve as packaging! He rebuilt the rods and crankpins. When completed, Ja 1267 took to the track and stunned everyone with its performance. The boiler "steams like a witch" according to Bruce and his only niggle is with the equalisation of the springing — the drivers are prone to slipping.

After the Ja, Bruce had a rest for a couple of years and started building *Livingstone* in early 1985. Progress was good for a couple of years, then he had a break and has been working off and on since. He estimates the total time spent so far as being around four years, with another six months to go. And what then? Bruce, 73 and a bit philosophical with it, says if he builds another loco, he'd like it to be 7¼" gauge. Anything in mind? Bruce likes the idea of a Garratt, either freelance, or something from Tasmania, and the Australian Standard Garratt appeals. Three or four years full time if he starts the project, and then maybe he'll hang up his micrometer. One thing — Bruce likes locos to do work, and he is adamant *Livingstone* will not be a museum piece. "No," he says, "she'll be a runner."



Noel Pope, Mayor of Tauranga performs the official opening with the assistance of Expo organiser, Les Moore (left) and club president Peter Jones (right)

design. Ken McIntyre won with his *Southern Belle*, an outstanding machine. Dave then handed out fines to those unfortunate enough to be caught doing something they shouldn't have!

Noel Pope, Mayor of Tauranga and the Club Patron, took the opportunity to praise the fellowship and cameraderie of model engineers as a whole, and thanked the Tauranga club for putting on a fine effort which did the city proud. Noel then presented the **Canterbury Award** for Best in Show to Bruce Fordyce for his model of *Livingstone*, a 1½" scale NZR Rogers 2-4-4T. Bruce will keep the award, a handsome gold plated steam engine flywheel, until it is awarded again at Blenheim in 2000.

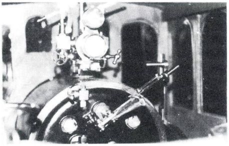
A special commemorative plaque was given to Les Moore for his untiring work in organising and running the event and exhibition. The award was handed over to tumultuous applause and ended with three cheers for Les and his small team. Les also got the **Crunchie Bar Award** for grottiest loco — I think the repaint is on indefinite hold until Les kicks his chocolate addiction! Paulette Morton had been unwise enough to bet Monty George that his traction engine wouldn't be ready for the Expo. Monty proved her wrong and called her bluff - Paulette sportingly paraded in front of the audience wearing a sandwich board saying she didn't think he could do it.

Bill Parker from MBM Model Engineering Supplies rounded out the ceremony by presenting the MBM Award for Most Popular Locomotive to John Harman for Shirley, his *Lil' Lima* in 7¼" gauge.

A happy driver on Ken McIntyre's new Phantom Southern Belle *which not only won the Ikon Cup but attracted a five dollar fine for giving people flash burns with all that brasswork*

Most attendees wandered off to the track to take advantage of the beautiful calm, clear night. The temperature had fallen considerably and steam was lingering around the station and locos. Only a handful of locos were running so larger trains were made up. Probably because cinders are incompatible with good clothes, quite a few people left after only having a ride or two and again it was the diehards who had the track to themselves. Running models at night is always something special, the steam hanging in clouds, the cinders dancing like fireflies high in the air, the rush of cold air on your face all adds a little extra magic. For some reason the sounds of the train are louder and you always seem to be going faster than you really are.

On one late trip I was on my own at the back of six empty trolleys. The loco in the distance working up the grade, a black string of cars snaking back to me, I leaned back and looked up at the stars while we clattered over the rails. Instantly memories came flooding back of a trip in the van of an express goods, leaving Frankton at 2am, and me leaning on the verandah rail looking up into the cold night sky. Absolutely unreal. Ignoring protests from some who wanted to keep going until dawn, we called it a night just before twelve.

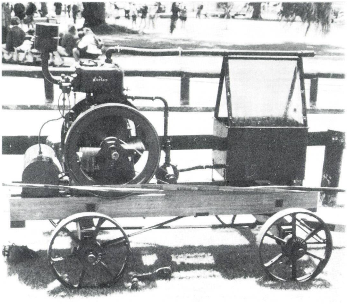


A look inside the cab of Bruce Fordyce's Livingstone

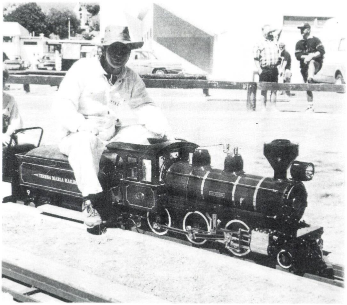
Sunday

Despite the late finish, people were busy at the track from fairly early on. An interdenominational service was held at the memorial at the southern end of the park. Sunday was almost a repeat performance of Saturday, with good crowds visiting the track and exhibition from mid morning onwards. Thin cloud kept the worst of the sun off and a light breeze helped cool the air.

Lunch was a quick affair as I didn't want to miss the MEANZ meeting at one o'clock. That broke up at afternoon teatime and again we emerged blinking from the hall to see a huge number of people thronging around the park. There were more sailboats on the pool, and people sometimes stood three deep watching them dance around each other on the water. I only saw one collision in the time that I was there, which says a lot for the skill of the modellers sailing them. Two big Lanz tractors had arrived earlier in the day and they were idling away by the other machinery. It was amazing to watch these beasts bobbing up and down in time to their engines.

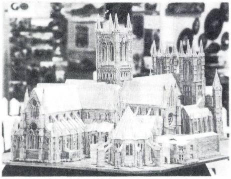


An intriguıng feature of this Lister portable is the water cooling gear. Fine streams fall onto gauze sheets on an inverted 'V' frame before dropping into the main tank



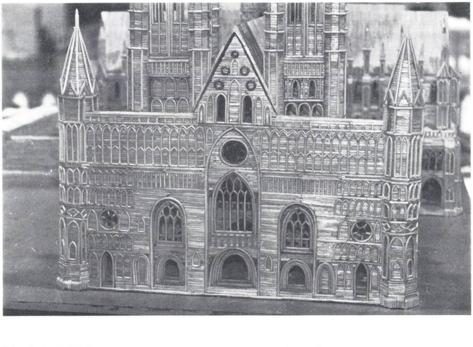
Just out of the box is this beautiful Phantom, No 111 Sir Byron by Terry Armstrong of Hamilton....in our photographer's opinion, the pick engine of the meet

A barbecue was laid on for six o'clock and we fortunately got in early as the queues for sausages and rissoles stretched away. Salads and spuds were served inside *Daniel's*. My son Samuel was having a good cry by this time, as tired twelve-month-olds are prone to do, so I ran the family back to the motel and returned with my 4½ year old daughter, Ashleigh. We explained tonight was special — she could stay up past bedtime to play trains with Dad!



(above and below) You don't have to work in metal to be creative. This 1:150 scale model of Lincoln Cathedral took C Wilde from Tauranga more than 1500 hours over three years to build using over 30 000 matches. The interior is fully detailed and the roof lifts off to allow access

Play trains we did! Steve James from Thames kindly did the honours of first ride with his Phantom, painted a nice shade of light blue. Peter Anderson of Hutt Valley had steamed up *Amy*, a 1" scale 3½" gauge NZR Y class shunter, and Peter insisted I drive. *Amy's* boiler is around the size of *Rob Roy's* and it was certainly a challenge to consistently manage. She has a large firebox and made steam very easily - too easily at one point, I was trying to get the water level up but the safety kept blowing off, making the water level drop before my eyes! I also found out not to run with too high a glass, as when shutting off for the station some water got carried over to the superheater. With a closed regulator the engine just burst into a second or two of frantic slipping. Perhaps the same thing contributed to the "uncontrolled slipping" that destroyed the motionwork of *Blue Peter* in the UK a couple of years ago.



After a short while I was getting the hang of things but handed the loco back to Peter. It takes a different kind of skill to keep a tiny engine going, and if anyone thinks they are experienced drivers on larger locos, try a little one for some re-education! We then rode all the other trains that were still running, all the while getting steadily colder. Ashleigh and I called it a weekend around ten, and I took a very tired but very happy little mouse home to bed.

Monday

Because we had quite a way to travel home (add the obligatory two hours for travelling with small kids), we decided to leave on Monday morning. Quite a few people had the same idea which left the track fairly clear for those who stayed to enjoy the freedom. The Last Supper was held at a Chinese restaurant in town and would have been most enjoyable for those who made it that far.

Wrap up

A very good touch were the large red dots on convention name tags identifying Tauranga members. Without fail, hunting down a red dot resulted in any assistance required being quickly and courteously provided.

I'd like to acknowledge the help given by Paulette Morton of Palmerston North who was my designated 'babysitter'. The Tauranga club gave me completely free access to the exhibition hall for a three hour after-hours photo session and Paulette was roped into escorting me. She wound up being of great assistance in setting up photos and saved me a lot of time and aggravation.

Keenest visitor had to be Graeme Harris from the Maidstone club in Upper Hutt. Despite limping around on crutches, he is always in the thick of things and his recently acquired 7¼" gauge Single Fairlie was in steam all day every day, giving many drivers the opportunity to drive this beautiful machine. Good on you, Graeme!

I can't thank the Tauranga members enough for a marvellous convention. I hope Les has a choice spot to put his plaque of appreciation, he certainly earned it a dozen times over. Well done, guys, see you at Blenheim.

With Tauranga such a great success, everyone is now looking forward to the next two Expos:

2000 — January 6-11, hosted by Marlborough Associated Modellers, Brayshaw Park, Blenheim.

2002 — January (dates to be advised), hosted by Palmerston North Society of Model Engineers, Mariner Reserve, Palmerston North

We say goodbye to Tauranga with a shot of John Harman's spotless Li'l Lima*, winner of the MBM Model Engineering Supplies most popular locomotive award*

Model Engineering Association of New Zealand

Annual General Meeting, Tauranga, 11 January 1998

by Charlie Lear

The Model Engineering Association of New Zealand has been set up to provide a unified voice for clubs to represent the interests of our hobby to government departments and regulatory bodies, very much like the AALS in Australia. I attended the AGM, held during the Tauranga Expo, as an interested observer. These notes are my personal comments only.

Most clubs within New Zealand are members of MEANZ and nearly all were able to send a representative to the meeting. The policy is "one club one vote" which stops any perceived hijacking or railroading of matters by larger clubs. Observers from one of the clubs outside MEANZ were present and I hope that what they heard and saw convinces them of the benefits to be gained by joining.

Progress is being made on unified Australian and New Zealand codes of operating practice and boiler standards. If the AALS and AMBSC regulations get incorporated into the unified Amusement Devices Regulations it is extremely unlikely that any changes will be permitted. This is a disappointment to some who would like to see the 100 psi limit raised before incorporation in a New Zealand ADR, but the consensus is that the more important issue is getting acceptable regulations in place.

MEANZ is currently waiting for relevant departments to get back to them. The meetings held so far with regard to Amusement Devices have been cordial and positive and MEANZ has offered full assistance to the overworked people involved.

Affiliation with the AALS was then ratified, formalising an arrangement from Cobden when the AALS voted to link with MEANZ. The link is for political and informational purposes only and there are no financial implications either way. Members then voted to drop the whistle codes from MEANZ suggested rules. It was felt the AALS whistle codes were too cumbersome, conflicted with existing New Zealand practice, and everybody used their own interpretation anyway.

The vexed issue of driver licensing came up and was discussed in a spirited fashion. Various issues of competence were raised, versus a blanket authority to drive. I think it is apparent to all that someone deemed competent on their home track might be a menace elsewhere. The onus is on the safety officer of the host club (and we ALL have one, don't we!) to allow a visiting driver on the track. It was refreshing to see it advocated that people need to learn to say NO as far as some drivers and boilers are concerned. It was felt the issue could not be adequately addressed in the time available so a questionnaire is to be circulated to member clubs to aid in drafting recommendations.

The question of meetings was dealt with and from now on the AGM will be held as a meeting at the Expo convention and as a postal meeting in "off" years. Another questionnaire regarding the desirability of a group public liability insurance scheme is to be sent to member clubs.

From the floor was a question regarding the provision of club boiler certificates for commercially built boilers. This did not cover boilers specifically built at the request of another club member, or a member from another club, but only boilers built by a club member "on spec" for sale on the open market. This was deemed commercial activity and MEANZ will not condone the provision of test certificates for commercial boilers. No change to the regulations is necessary as the existing rules (or those in the process of being adopted) show that the responsibility for allowing these boilers is with the individual club boiler committees.

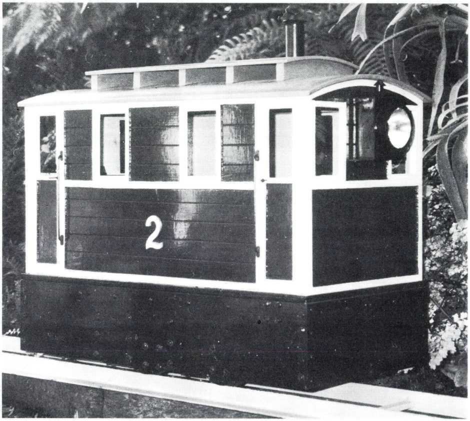
Last on the agenda was the selection of host club for the 2002 Expo. As this affected all clubs, not just those in MEANZ, observers from Canterbury were invited to participate in the vote. Palmerston North and Hamilton both made very good presentations which highlighted the advantages and facilities of each. Representatives of both clubs were asked to leave the room before the vote took place. Palmerston North emerged the successful candidates — much to the delight of those involved! Hamilton, hang in there, your turn will come. Congratulations to the Palmy team and I'll certainly be there in four years.

A Great Eastern Tram

Part 4 of a construction series of a 5" gauge battery-electric powered tramway locomotive

by John Campbell

Photos by the author unless otherwise noted, drawings for publication by Peter Manning



Keith Hartley decided to add a clerestory roof to his tram engine. It simply consists of five battens curved to fit the original roof and a layer of ply attached to the top. It gives it a "Sydney Steam Tram" look. Keith's engine runs well on public days as well as giving pleasure to his grandchildren.

Photo: Keith Hartley

Roof

My friend and near neighbour Albert is an expert woodworker and he provided the curved roofs for my locomotives. He made the special press which is illustrated on the following page.

The roof is made of two layers of 3mm plywood glued together in the press. It is quite rigid when glued together, but will not be quite the same curve when it is released from the press. It would be a good idea to glue a sample strip about 30mm wide to prove the layout of the first unit of the press before completing the other three units. It is better to have the curve a little tight or concave so that the edges will be in contact with the sides of the cabin. A small gap in the centre of the ends can easily be covered with a small square beading.

A simple roof press

The top frames of the press are cut from 75 by 20mm pine and the lower frames from 50 by 20mm. The press is held together with 180mm lengths of ¼" studding with washers and nuts. The actual contact pressure is applied by four pairs of longitudinal 20mm by 20mm hardwood strips. These pairs must oppose accurately to get the proper clamping pressure.

When the white glue is applied to the plywood pieces they will be quite slippery and a fine nail may be placed near the middle of the test strip.

Allow the strip to set overnight and check the curve when it is released. Any adjustments to the press unit can be made and if you wish you can try another test strip.

When you are satisfied complete the other three units of the press and join them with the longitudinal strips.

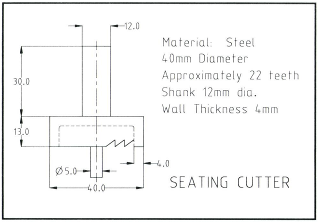
Be generous with the size of the plywood pieces for the roof as it is not easy to get them quite square in the press while it is easy to trim the roof when it is glued. Be generous with the glue also. Fine nails placed near the centre of the ends will help you to keep the pieces in position while you bolt the press up tight.

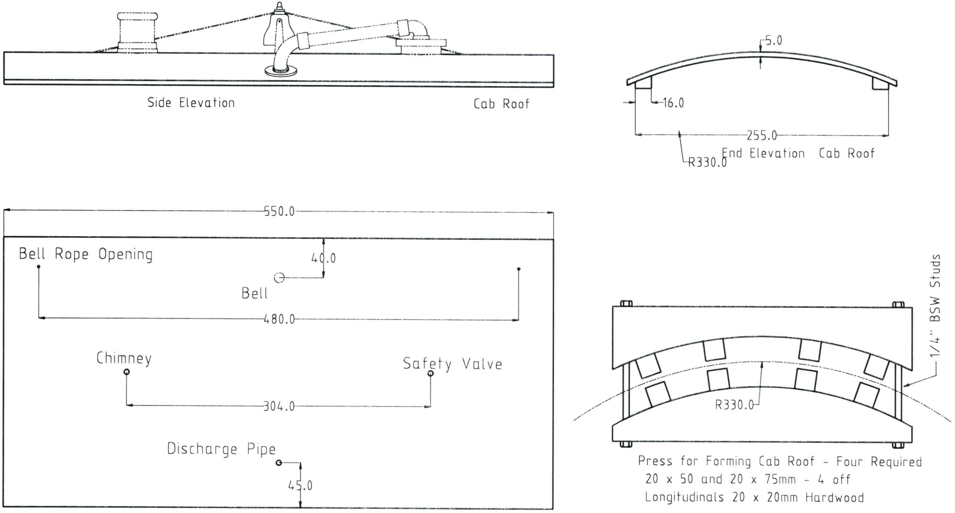
When the roof has been removed from the press place it on the body and draw the outline on the underside of the roof. Allow for the necessary overhangs at the sides and ends and mark out the outline on the upper surface. The cuts at the sides should be vertical and not at right angles to the curved surface. If you can get the use of a circular saw with a wide table this is easily done. If you are not satisfied with the sawn edges you may glue veneer strips to cover them but I found that a little auto body filler made a satisfactory edge. As mentioned above, a 3mm square bead may be glued to cover the joints at the front and rear ends.

The roof is located by either corner blocks or curved ends which are glued in place. Do not make the roof too tight a fit as access is required to the battery and controls.

A special seating cutter

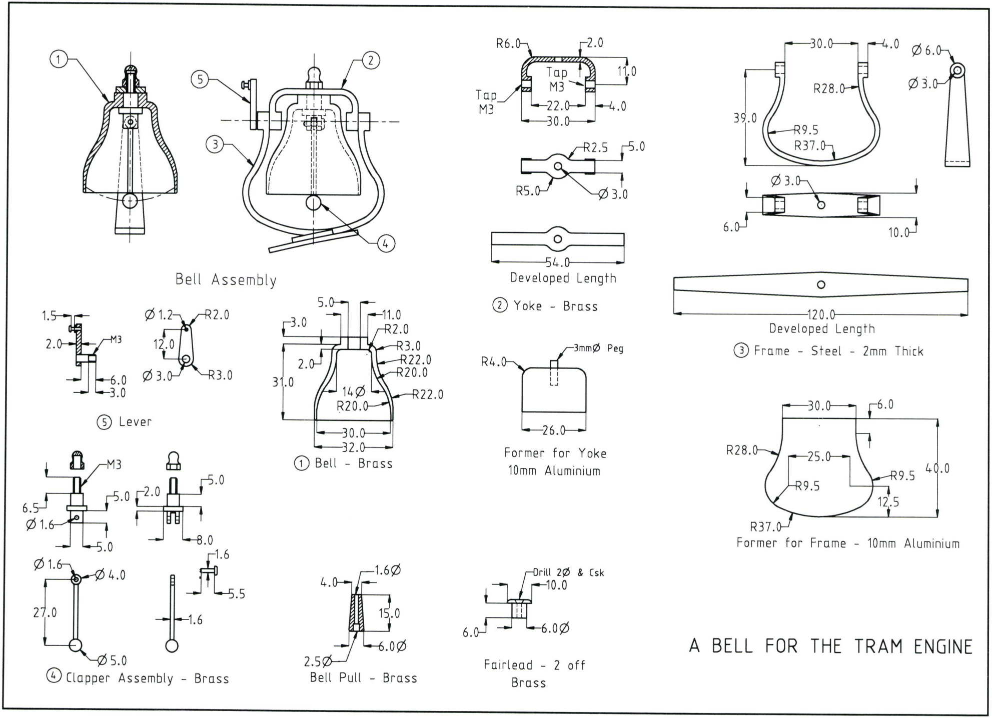
Before sanding and painting the special hole saw cutter is used to cut the seatings for the chimney and safety valves. The holes for the brass guides for the bell ropes may be drilled and the mounting holes for the steam return pipe and the bell frame are located from these items. My roof is painted grey outside and light yellow inside to match the inside of the cabin of my loco.





ROOF AND FORMER DETAILS

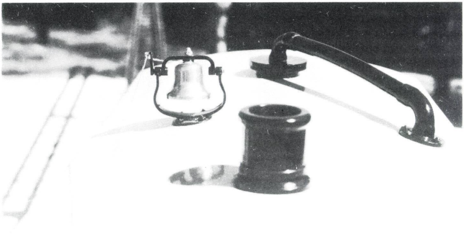
A BELL FOR THE TRAM ENGINE



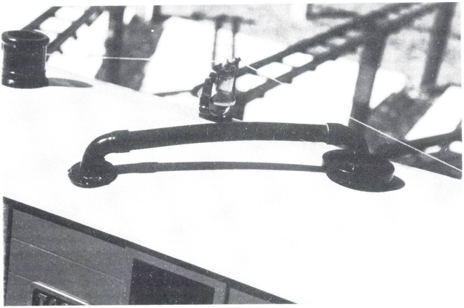
Bell

As a tram engine running on or beside public roads it was required to give audible warning and so is equipped with a bell. My bell has perhaps a rather American flavour but looks rather smart. The bell is turned from brass and bored out to the approximate shape of the outside. A 5mm hole is drilled through for mounting and then the bell is parted off. The bell may be mounted on a mandrel for polishing with the various grades of abrasive paper and Brasso. The mounting bolt also serves as the attachment for the ringer. The ringer is also turned from brass in one piece, the length being measured from the bell, and is pinned to the bolt.

The bell frame is in three pieces, a base, the main frame, and the moving frame. The base is turned from steel or brass and drilled for four 3mm mounting bolts. The centre of the base will need to be filed or milled at an angle of about 12 degrees for the bell to stand upright. The main frame is bent up from 2mm steel, and although it may seem a long way around it is easiest if a former is made to bend it on. The pivot bearings are made in one piece and brazed to the frame at the same time as the base. The bearings are then separated and the assembly cleaned up. The moving frame is also bent around a former and the bosses brazed on in the same way. When the pivots and ringer arm are attached the assembly must operate freely. The bell is attached with an ornamental brass nut.



The two photos on this page show the roof detail items, the bell, chimney and safety valve discharge pipe.

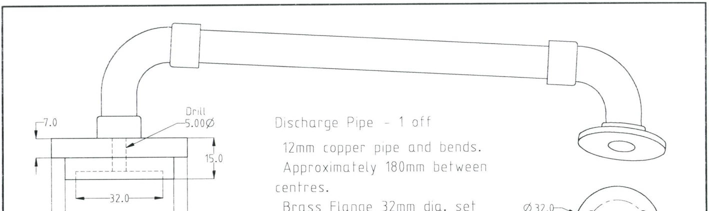


The bell cord may be of strong thread, but I found some fine flexible stainless wire in the disused copier which seems to be childproof. The cord passes through brass fairleads in the roof and has brass pulls attached to each end. After all of this you will probably find that you cannot hear the bell as it will only give a faint tinkle.

A more audible bell can be made from a counter bell modified and mounted under the rear end of the roof. I think that by this stage you will be able to work this out for yourself.

Chimney and safety valve

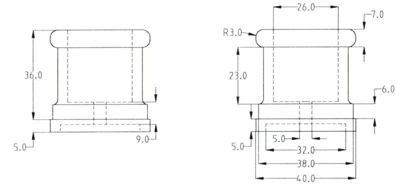
The chimney and safety valve are seated on the curved roof and it is necessary to make flat seatings for them. I made a simple hole saw from mild steel to cut a shallow seating in the roof and did not bother to harden the teeth. The bases of the fittings are made to suit and they are attached by 5mm screws with large washers.



7.0
Drill
5.00Ø
15.0
32.0
40.0
50.0
Safety Valve - Aluminium
Discharge Pipe - 1 off
12mm copper pipe and bends.
Approximately 180mm between centres.
Brass Flange 32mm dia. set to fit.
Plug Both Ends and tap 5mm.
Ø32.0
Ø12.0
Ø22.0
P.C.D.
Ø3.0

The chimney and safety valve are turned from aluminium. It was necessary for the discharge from the safety valve to be silenced and a discharge pipe was taken to the side tanks for this purpose. I have used a piece of ½" copper pipe with two cut-down right angle plumbing fittings. A mounting plate for three 3mm bolts is brazed to one end at the correct angle while the other end is closed with a plug which is tapped for the screw which attaches the safety valve.

To be continued...



Chimney - 1 off - Aluminium

Safe and Simple Rust Removal

by Geoff Howarth

To those of us who model in non-ferrous metals, rust is not a problem. However, to those of us who do use ferrous metals as their medium, the problem of rust is ever present. Restorers of models, particularly steam models and antique machinery, probably have the most headaches with small steel screws, etc. that are so often frozen solid by rust. To try to remove them with brute force only leads to the possibility of an unsightly scar which is usually impossible to cover up.

The following is a safe, simple, non-destructive process which has absolutely no effect on the physical dimension of the article at hand. On completion of the process there will be no damage other than that caused by the original corrosion itself.

All that is required is one pound (457g) of washing soda (sodium carbonate) to every gallon (4.55ltrs) of water needed to completely cover the item or items to be cleaned. A suitable plastic or glass container (ie. a plastic bucket or glass battery jar) and a 6 volt battery charger capable of supplying 4 to 6 amps on a continuous basis without overheating.

Fill the chosen container with the washing soda and water solution and suspend a lead anode in it — a strip of lead flashing will do fine. Just fold the lead strip so it can hang over the side of the container and into the solution, keeping it well clear of the items to be cleaned. Next, suspend the items to be cleaned from a metal rod which should be firmly fixed to the top of the container. This rod or tube can be made of copper or any reasonable conductor, likewise the wires for suspending the items. *WARNING*: It is most important that the items being cleaned and the anode do *not come into contact* with each other as the items being cleaned will certainly be damaged if arcing occurs. Make sure the solution container is large enough to safely accommodate everything.

With the items to be cleaned and the anode suspended in the solution connect the positive (+) red lead from the battery charger to the lead anode. Next, connect the negative (-) black lead from the battery charger to the copper rod/tube supporting the items to be cleaned. Finally connect the battery charger to the power supply and turn on the power. A slight effervescence will be noticed rising the solution from the items being cleaned. The process has begun!

If you have used a clear glass container you will soon notice small flakes of rust falling to the bottom of the jar as it is loosened. A few hours will remove light to medium rust but severe rusting will take considerably longer. So leave the items in the solution for as long as it takes, because as I have already said, no damage will occur at all. For stubborn rust deposits the process may be hastened by lifting the offending items from the solution, giving them a scrubbing with a soft wire or nylon brush and returning them to the solution.

When clean, remove the parts from the solution, rinse thoroughly in clean warm to hot water, dry and then lightly oil. The end result will be a pleasing metallic lustre on the items cleaned, and a light shot of penetrating oil while they are still warm should see all screws removed easily. If any screws are still stubborn simply be patient and return the item to the solution — it will be well worth the time spent! This process was passed on to me by some colleagues and I have used it with considerable success.

SAFETY WARNING

When de-scaling items using the electrolytic process certain precautions most be taken.. While the chemicals used in the bath, usually bi-carbonate of soda, are themselves harmless, it is very likely that any paint on the item being de-scaled will be of the old lead-based type. This means that the lead removed will be in the bath solution. ***Lead is a very toxic substance.***

Therefore it is vital that the bath is not accessible to children and dogs. A recent case has been notified where a dog drank from a de-scaling bath, went into convulsions and was minutes from death when got to a vet. (The vet's bill was $450 and blood tests later confirmed a very high blood lead level. Symptoms included the convulsions and a very high body temperature, while treatment included stomach pumps, running cold water over the dog to lower its temperature and many expensive injections.)

The following safety precautions should therefore be taken when electrolytically descaling metal:

- Wear heavy duty rubber gloves when handling wet items. The lead can be absorbed through cuts etc. in the skin.
- Protect the bath in such a way that dogs and children can not access the liquid. remember also that due to the hydrogen formation during the process, the bath should be in a well ventilated area or outdoors when operational.
- Keep the bath covered when not in use and dispose of the bath in an environmentally safe manner when no longer required, remembering that the lead, in solution, may enter the ground water supply if just tipped out on the ground.

(Courtesy of Australian Steam Power)

Club Roundup

compiled by Neil Graham

Galston NSW

The annual October Weekend to celebrate the co-operative's 24th birthday was a great success. The interclub activity on the Friday and Saturday was very busy, however the public running Sunday was less well patronised than usual due to the unseasonable hot weather. A good display of working stationary model complemented the railway activity. The award for the best example of an internal combustion engine was won by local member Alan Fern for his magnificent Cirrus engine.

A scale timetabled running day was held in mid November and was attended by 37 members. This inaugural event was deemed a a huge success by the participants. There is talk of similar events being run in the future.

A training day was held for twenty new members to initiate them in an understanding of the club structure and the workings of the railways and safety procedures to name but a few.

On the work front the arboreal tunnel is finished and now awaits nature to complete the task. The unloader traverse has been increased to give better access and alignment. White safety paint has been applied to edges of all bridges, platforms and parking areas

Hornsby Model Engineers Co-op Ltd
Location : 29 Mid Dural Road, Galston
Public Running: 2nd Sunday each month

Cobden Vic

The interclub invitation run over the October 18/19 last was a great success with many visiting modellers and some 20 locomotives. Some seven clubs visited for the weekend. Some even brought their carriages and helped move the large number of patrons riding on the Sunday as part of the Spring Flower Festival.

The gardens continue to improve with a lot of hard work put in by the green thumb brigade. A very busy time was had over the holiday period with 17 running days at the track during December. January bookings were also heavy.

The Small Gauges Run (mostly for 3½" gaugers) was an interesting concept tried for the first time but there was only a limited turn up for the run. It is hoped to develop the concept further in the future.

Two new additions to the locomotive runs are a pair of 2-6-0- Baldwins nearing completion — and they have Briggs type steel boilers which should give them plenty of adhesive weight.

South Western Model Engineers Inc.
Location: Grayland Street, Cobden
Public Running: 3rd Sunday each month

Eltham VIC

The Diamond Valley Railway has continued its community committment by nominating three local charites for support during 1998.

On the projects front, a new picket fence has been erected around the new No.1 platform at the Diamond Valley station. The Kingston Bridge has been completed. Work continues on the construction of new track panels for continuing track replacement. Work is proceeding on the constructrion of the new UP line between Meadmore Junction and Diamond Valley.

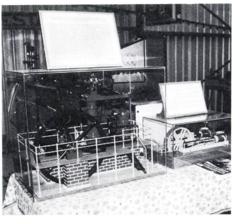
The DVR took part in the Eltham Festival and it was considered to be a success.

Diamond Valley Railway Inc.
Location: Lower Eltham Park, Main Road, Eltham
Public Running: Every Sunday except Christmas

Tamworth NSW

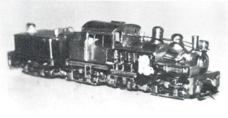
This new club continues to grow with membership now standing at 28 total.

On the weekend of 16-17th August a display was had at Tamworth Agricultural Museum and a diverse range of model engineering interests were on display. Also on display was the proposed trackplan for the miniature railway intended for construction in Hyman Park, Tamworth. This display drew the most interest from visitors, with much encouragement from the public to pursue the project to completion.



A section of the display featuring the work of Allan Tanner

Dave Evans from the Newcastle club was a welcome visitor to a recent meeting and gave members a good insight on a wide range of topics from boiler construction to club operation. The club continues to get good support from the Tamworth City Council and Tourism Tamworth as the railway proposal goes through the official channels. Prospective new members are welcome.



A working electric N gauge Shay by Roger Hord of Tamworth

Tamworth & District Model Engineers
Location: Contact Geoffrey Young (02) 6766 7379
Meetings : Second Saturday of each month

Warner Qld

Trophy day was held with a good turnout. 1997 appears to have gone down as the year of the Fowler, as there were so many cane locos built or under construction that some members thought a virus had struck. A big crowd gathered around when Bill Williams got his "hit and miss" engine going. Championship Cup was won by Bob Campbell for his 3" Alchin traction engine.

The new sidings at the station exit have been completed. The station now has two full flow platforms which worked well at the November track day, reducing the number of trains banked up when using only one platform. The water storage tank behind the compressor shed is being moved to behind the bore pump shed. This will free up space on the eastern boundary.

Qld Society of Model & Experimental Engineers Inc.
Location: Warner Road, Warner
Public Running: None

Bulla Vic

Some of the 1997 years' highlights at the new Bulla site were the return to the club's own clubhouse for meetings, the erection of four bridges, the track moving outside the compound, connection of electricity and water and the continuing increase in membership.

The big news is that public running has now commenced, the clubhouse restoration proceeds and the public amenities are almost complete.

The society hosted a special day and made a presentation to the government and the City of Hume in an effort to gain support for the cause. The feedback was positive and it is expected to be favourably considered.

Tullamarine Live Steam Society
Location: 15 Green Street, Bulla
Public Running: 1st and 3rd Sundays

Auckland NZ

Auckland Soc. of Model Engineers

The theme for the next Easter Exhibition will be "The Development of Industrial Power". Safety rails are to be built around the old tunnel portal with the Tuesday club being the constructors. Bits and Pieces nights continue to be popular.

Scale Marine Modellers

Marine modellers from the North Island ventured to Hawera and it was reported that the lake at King Edward park is the finest stretch of water anywhere, including top overseas venues. With 40 odd ship modellers attending, a good weekend was had and on the 2nd day some 30 odd models of all types were seen on the lake. Some would like to see Hawera become an annual event.

One member has put forward an idea for an exhibition of all types of modelling for the year 2000. If it is larger than ModelX it may get more youngsters interested in the hobbies.

These two clubs share common facilities.

Location: Peterson Road Reserve, Waipuna Road, Panmure
Public Running: Every Sunday

Durban, South Africa

The club has had to appoint a Safety Officer to satisfy the requirements of the insurers. Preparations are in hand for the club's 85th Anniversary and the National Steam Meet in May 1998. Shower and changing room to be constructed, new steaming bays are being paved and a new fence between the car park and the track approaching the tunnel.

On September last a meeting of representatives of 11 of the 14 South African clubs was held and a wide agenda and items were discussed including the possibility of a national secretary to facilitate distribution of information between clubs and other matters of national and general interest.

Durban Society of Model Engineers
Location: Kellaway Hall, Hinton Grove, Virginia
Public Running: 2nd Sunday

Gosford NSW

The community hall/storage area was completed without the high costs normally associated with a large building.

The October run day was well attended with eight locomotives arriving for the roster. November was a very hot day, with five locomotives handling the traffic. Most popular was the September Birthday Run. Visitors and locos from Newcastle, Wollongong and the Berry clubs and a visitor from New Zealand. A good day was was had but the night run had to be cancelled due to rain.

Central Coast Steam Model Co-op Ltd
Location: Lot 10 Showground Road, Narara
Public Running: 1st Sunday

Invercargill NZ

The outdoor railway continues to be developed with the completion of an overbridge and more recently a tunnel. The station is nearly finished. This letter project should greatly enhance the club facilities A number of prospective membership inquiries were made at the Riverton Model and Miniature show.

Southland Society of Model Engineers Inc.
Location: Surrey Park, Invercargill
Public Running: None

Paraparaumu NZ

The club has recently changed its name to better describe its activities. Its is now the Kapiti Miniature Railway & Associates. While the weather has not been totally conducive to getting people to the park, running has continued each Sunday

Kapiti Miniature Railway & Associates
Location: Marine Gardens, Raumati Beach
Public Running: Every Saturday and Sunday

Petone NZ

The November Sunday runs all were reasonably served and patronised, with the 23rd being a real "beach" day and everyone kept busy with a good flow of passengers.

Hutt Valley Model Engineering Society Inc.
Location: Marine Parade, Petone
Public Running: Every Sunday

Maidstone NZ

Good progress has been made with the constuction of the ground level 7¼" railway. With the assistance of a work skills group some 10 cubic metres of concrete was laid, this being one third of the total required concrete. All the steel trackwork and points are fabricated to complete the track base laid. Once all the track is down, the run will be 200-250 yards total out and back.

Maidstone Model Engineering Soc Inc.
Location: Maidstone Park, Upper Hutt
Public Running: Unknown

Whakatane NZ

Resource consent has been granted for the proposed new track at Whakatane. There is plenty of space for development of the proposed new track.

Bay of Plenty Model Engineering Soc Inc
Location: Whakatane
Public Running: None

West Ryde NSW

The society will be celebrating its 50th Anniversary with a run on the weekend 21/22 March. The actual anniversary date is 13 July 1998.

From the works report news that the elevated railway carriages have had endboards made and fitted and improved drawgear including buffers has been completed. Varnishing and lettering and painting will complete the task. The compressor room has had an extensive refurbishment. A mammoth maintenance task has commenced on one of the ground level passenger carsets. Also wooden buffer beams have been fitted to this carset.

The running days have been well attended. The August run topped them with approximately 3000 rides taken and some spectacular locomotive combinations in operation. Big steam power combinations on the ground level railway with locomotives representing power from most states, TGR R class, WAGR V class, VR S class and a triple header including NSWR C-30T and D-59 classes and an Port Kembla steelworks 0-4-0 "Bitza" visiting from the Illawarra club.

Sydney Live Steam Locomotive Society
Location: Anthony Road, West Ryde
Public Running: 3rd Saturday afternoon each month

Wilson WA

The lake adjacent to the canteen has had the bullrushes and weed removed, transforming the whole area. Preparations are well in hand with much tidying up and maintenance being done in preparation for the 1998 Convention.

The 5" run day was fairly quiet with only four locomotives turning up, but nevertheless the 5" track got a good workout.

Castledare Miniature Railways of WA Inc.
Location: rear of 100 fern Road, Wilson
Public Running: 1st Sunday each month

Gore NZ

On the last Labour Weekend, on 25th October, several members took the opportunity to travel behind Ja 1271 when it was down this way

This year the Gore club will be having its 10th Birthday Celebration on the Labour Weekend, three days and possibly nights of running.

Work is commencing on the two club trolleys and the colour scheme has been agreed.

Gore Model Engineering Club Inc.
Location: Hamilton Park, Gore
Public Running: 3rd Saturday each month

Club Roundup contributions

AME is pleased to receive club newsletters for consideration in this section. Newsletters are often a good source of articles, which we appreciate all the more, but most of all they help us keep in touch.

It is often difficult to decide what to publish and what to leave out. and the task of selecting material for a wider audience takes a lot of time. Also, there is always the risk that AME will publish something that the club considers sensitive. Please help by sending a "press release" page with your newsletter, or highlight the items you think we could use. We'll give first preference to clubs that help us out this way.

djp

Tauranga NZ

A water treatment plant has been constucted and commissioned. Two of the members are responsible for the operation and maintenance. The Expo '98 has been and gone with great success. *(see separate report elswhere in this magazine ... ed.)*

Tauranga Model Marine and Engineering Club

Location: Memorial Park, Tauranga

Public Running: Every Sunday

Berkeley USA

A new steel switch has been installed at Bayview Station. Work has been done on drains and ditches on the Heinz loop where flooding has been a previous problem.

On the low track some ties have been replaced on the inner loop and six sections of steel track has been laid.

Golden Gate Live Steamers Inc.

Location: in Tilden Park, Loma Cantadas & Grizzly Peak Blvd., Berkeley CA.

Public Running: Every Sunday

Gisborne Vic

The first public run with the new portable track at the Gisborne market day has been a success. Takings were encouraging. If this can be repeated on a regular basis then an extension to the two foot gauge track is possible. This would allow the Perry to run further in the park and make it a better public attraction

The Gisborne Vintage Machinery Society Inc.

Location: Gisborne Steam Park, Webb Cres., New Gisborne

Public Running: 1st Sunday

Toowoomba Qld

Toowoomba Live Steamers is up and running again!! TLS has completed its new track at Kearney Springs Historical Park, Spring street, Toowoomba. The track is dual 7¼" and 5" and 656 metres in length. Steaming bays can accommodate up to ten 7¼" or twenty 5" locos. Public running is about to start as soon as further track testing is completed.

In the meantime, anybody wishing to run, please contact Bob Long on (076) 30 0146

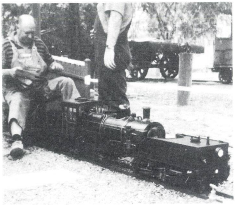
Rotorua NZ

At the December meeting, members voted to wind up the Rotorua Society of Model Engineers. The club has recently celebrated its 21st birthday, but membership declined to 3 or 4 active people. There were a number of reasons for the decision to shut up shop but this was the main one. It now remains to follow the legal procedures required to finalise an Incorporated Society

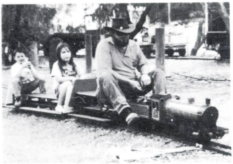
(As a past member of the Rotorua club during my stay in New Zealand several years ago, I am saddened by this news. I remember the delightful setting in the museum grounds where the track wandered above a stream over viaducts amongst the trees. On behalf of AME, I wish the members well for the future ... ed.)

Port Augusta SA

The club's annual steam up was held on the October long weekend at the club track in Homestead Park. Friday saw all members busy with last minute preparations when two visitors arrived early. In no time they had steam raised and were off on the track for the first run of the weekend. The locals were on the job early on Saturday and with visitors arriving regularly, it was a cuppa', a yarn and a piece of home made cake.



(above) John Gordon prepares to drive the Fyansford Garratt No.2 belonging to Keith Bradford while (below) Robert Davison heads out on the Port Augusta track with some young passengers on Ern Riding's Netta *0-8-0*



Sixteen steam and one electric locomotive were in attendance, the track was in good condition and no problems of any importance were reported. The running only stopped for a delicious tea provided by the club, about 60 people sitting down to it. For some of the more adventurous, running was on again after tea while others enjoyed a rest and a video. Sunday was just as enjoyable. There was public running on both afternoons, and quite a few locals and visitors called in. After tea on Sunday the dedicated ones were back on the track for another night run.

We are a small club, which meant a lot of effort by all, but we enjoy staging this weekend and the compliments received and the pleasure given make it all worthwhile.

Port Augusta Model Engineers Society

Location : Homestead Park, Elsie Street, Port Augusta

Public Running: 1st Sunday

Coming Events

14 to 15 March
Invitation Weekend - Hamilton NZ

HME members host their annual open weekend, Minogue Park, Hamilton.

22 March
50th Birthday Invitation Run - West Ryde NSW

Come and celebrate 50 years of operation with the members of the SLSLS at their Anthony Rd. track site. 2½", 3½" and 5"g. elevated and 5"g. ground level.

10 to 13 April
AALS Convention

Castledare Miniature Railway, Wilson,WA. Contact Ken on (08) 9375 1223

1 to 3 May
South African National Steam Meet

Hosted by Durban Society of Model Engineers, Virginia, RSA.(Note date change)

2 to 3 May
Lake Goldsmith Rally

Rally site located via Beaufort, Vic.

2 to 4 May
Annual Labour Day Run - Mackay Qld

All welcome. Contact Len Heaton (Sec.) (07) 4959 2169.

9 to 10 May
NSW Interclub Run - Orange NSW

5"g. track only (470m.), 240 volt, comp. air, char and petrol available. Some loco storage, some camping (limited). Contact Bob MacKinney (Sec.) (02) 6362 0456.

6 June
D-Day, HME at Galston NSW

A **D** for Diesel day will be held at the Galston Valley Railway, 29 Mid Dural Rd, Galston. Petrol or electric traction also invited. NO STEAM locos please 3½" and 5"g. only. Call (02) 9484 7583 s

6 to 8 June
Hot Pot Run - Illawarra Live Steamers

1 August
Grandchester Qld - Grand Opening

New 5"/7-1/4" track opening in conjinction with Qld. Railway Heritage Weekend (birthplace of QR 133 Years). 2 Ipswich Rd, Grandchester . Mark (07)5465 5768

8 - 9 August
Blowfly Rally

Hosted this year by the Illawarra Live steamers

3 to 6 September
Major Centenary Exhibition

Hosted by the SMEE, (UK) 1898-1998, and located at Brunel University, Uxbridge, West London. Information from SMEE 100, Resources Exhibitions Ltd, 2 Forge House, Summersleys Road, Princes Risborough, Bucks, HP27 9DT, UK. Phone 01844 34 2894. Fax 01844 34 4988. e-mail: CRE@resourcex.co.uk

Steam Valve for Injectors

by Ted Murrell

drawing for publication by Neil Graham

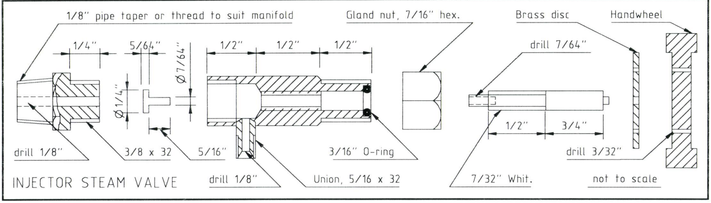
I had a lot of trouble with injector steam valves, if they were turned off hard enough to stop them leaking, they were very difficult to turn on. I tried 'O' rings in various ways with very little success, so I tried the pad or button as shown in the article.

There is nothing too much out of the ordinary about the valve body and it is not difficult to make. The main difference being that the valve spindle does not have the conventional conical end on it, but is drilled 7/64" for some 11/32" deep to take the stem of a button valve of stainless steel.

The brass disc is silver soldered to the spindle and the plastic handwheel (fingerwheel) is rivetted to the brass disc with 3/32" copper rivets.

For a steam valve as shown, use a 3/16" outlet pipe union. On the drawing you will notice several drillings of 1/8". This matches the bore diameter of 3/16"copper tubing or pipe.

Finally, the centre of the pad or button, should be recessed to reduce the contact area. Recess slightly by drilling with a 5/32" drill, then file a chamfer around the outside edge leaving a 1/32" wide circular contact area.



AME Magazine...
Reading about it is the next best thing to doing it!

BSW to BA Conversion for 1:12 Scale

by Warren Williams

This chart (next page) is primarily intended for those model engineers building 5" gauge locomotives to 1:12 scale but is of course equally applicable to any other model engineering in this scale.

Use of the chart is best described by way of example. Say for instance that we are building at 1:12 scale and that the prototype (full size) drawings call for 7/8" BSW bolts to attach the running boards to the frames. We want the proportions of the scale bolts to look right but we are not quite crazy enough to start machining scale 7/8" BSW bolts. The conversion chart helps us to find a compromise. Proceed as follows:

- Look up 7/8 BSW in column 7 (nearest BSW size) — reading across to columns 1 or 10 tells us that 9BA is the nearest 1:12 equivalent. Also in column 7 is shown (7/8) matching up to 10BA. The brackets around 7/8 mean that this is 2nd best, but in this instance maybe preferable as 9BA supplies are not so easily found. Anyway, being fairly pedantic we select 9BA.
- Being diligent model engineers, we want to know what type of compromise we've just made "i.e. how close is the 7/8" BSW = 9BA conversion?"...Will my friends be able to tell?". Column 6 (OD" x 12) tells us that 9BA, whose OD = 0.0748" (from column 2) is exactly a .8976" BSW thread, which of course does not exist, but is nearest to 7/8" or 0.875". Hence the title of column 7. The error in making 7/8" BSW = 9 BA conversion is the difference between exact and nearest, i.e. in this case the error is 0.8976" - 0.875" = 0.0226" in full size, or a 1:12 scale error of 0.00188"! (Sigh of relief — they won't be able to tell!)
- Now that we've worked out what the equivalent thread is we need the proportions of bolt, screw or nut. BSW is unlike many thread systems which simply have a formula for fixed relationship between the proportions of A/F, A/C, thickness of head, etc. The relevant British Standard, BS1083 merely specifies particulars for each thread. Columns 3,4 and 5 tell us that for a 1:12 scale 7/8" bolt, the across flats (A/F) dimension is 0.1078", the thickness of the head of the bolt is 0.0478", and that the thickness of the nut is 0.0621". Of course commercial suppliers may not have exactly what we have just specified but at least we know what is correct for the job and can make an educated compromise.
- To save us looking up yet another chart, columns 8 and 9 give tapping and clearance drill sizes.

B.S.W. TO B.A CONVERSION FOR 1:12 SCALE MODEL ENGINEERING

COMPILED BY W.WILLIAMS 24-11-92

SIZE .B.A.	OD" (BS93)	CORRECT SCALE PROPORTIONS			OD"x 12	NEAREST B.S.W SIZE	DRILLING SIZES		SIZE .B.A.
		A/F"	T" (BOLT)	T"(NUT)			TAP	CLEARANCE	
0	0.2362	N/A	N/A	N/A	2.8344	N/A	0.2008 5.1mm,No7,8	0.2480 6.3mm,1/4"	0
1	0.2087	N/A	N/A	N/A	2.5044	N/A	0.1772 4.5mm,No15,16	0.2191 5.6mm,No2	1
2	0.1850	N/A	N/A	N/A	2.2200	N/A	0.1575 4.0mm,No21,22	0.1943 No9,5.0mm	2
3	0.1614	0.2275	0.1083	0.1450	1.9368	2	0.1358 No29,3.5mm	0.1695 No18,11/64"	3
4	0.1417	0.2125	0.0950	0.1346	1.7004	1-3/4	0.1181 3.0mm,No31	0.1488 No25,3.8mm	4
5	0.1260	0.1831	0.0817	0.1138	1.5120	1-1/2	0.1043 2.65mm,No37	0.1323 3.4mm,No29	5
6	0.1102	0.1531	0.0675	0.0929	1.3224	1-1/4	0.0906 2.3mm,No43	0.1157 No32,2.95mm	6
7	0.0984	0.1379	0.0608	0.0829	1.1808	1-1/8	0.0807 2.05mm,No46	0.1033 N037,2.65mm	7
8	0.0866	0.1228	0.0543	0.0725	1.0392	1	0.0709 1.8mm,No50	0.0909 2.35mm,No42	8
9	0.0748	0.1078	0.0478	0.0621	0.8976	.7/8	0.0610 1.55mm,No53	0.0785 No47,2.0mm	9
10	0.0669	0.1078	0.0478	0.0621	0.8028	(7/8)	0.0551 1.4mm,No54	0.0702 1.8mm,No49	10
11	0.0591	0.0996	0.0408	0.0568	0.7092	.3/4	0.0472 1.2mm,No56	0.0621 .1/16",No52	11
12	0.0512	0.0838	0.0343	0.0464	0.6144	.5/8	0.0413 1.05mm,No59	0.0538 No54,1.4mm	12
13	0.0472	0.0763	0.0308	0.0413	0.5664	.9/16	0.0384 No62,0.95mm	0.0496 1.3mm,No55	13
14	0.0394	0.0680	0.0282	0.0360	0.4728	.1/2	0.0312 .1/32",No68	0.0414 1.05mm,No58	14
15	0.0354	0.0588	0.0248	0.0308	0.4248	.7/16	0.0276 0.7mm,No70	0.0372 0.95mm,No62	15
16	0.0311	0.0497	0.0213	0.0256	0.3732	.3/8	0.0236 0.6mm,No73	0.0327 No66,0.85mm	16
17	0.0276	0.0435	0.0178	0.0204	0.3312	.5/16	0.0218 0.55mm,No75	0.0290 No69,0.75mm	17
18	0.0244	0.0435	0.0178	0.0204	0.2928	(5/16)	0.0192 0.48mm,No76	0.0256 0.65mm,No71	18
19	0.0213	0.0368	0.0143	0.0163	0.2556	.1/4	0.0164 0.42mm,No78	0.0224 No74,0.58mm	19
20	0.0189	0.0368	0.0143	0.0163	0.2268	(1/4)	0.0147 No79,0.38mm	0.0198 No76,0.52mm	20

NOTE:

(1) Nearest size B.S.W shown in brackets is second choice ,based on scale accuracy.

(2) Scale proportions A/F",T"(BOLT),T"(NUT) are mid tolerance range values from BS1083,1965 Table 1&2 nuts are "ordinary",not "lock-nuts" which are thinner)

(3) B.S.W nuts have 30° chamfer on both faces

(4) B.S.W bolts have 30° chamfer on head face only

(5) Many early manufacturers also made their own fasteners and hence BS1083 may not be applicable

(6) Drill tapping sizes are based on 75% thread engagement in accordance with BS1157,1953

(7) Drill clearance sizes are based on 5% diametral clearance on thread major diameter (BS93,1951)

Traction Engine Tracks

by Bill Fowler

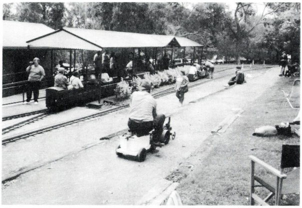
As the owner of a 4" scale (220kg) model traction engine, I find it a problem locating clubs with facilities to run traction engines. All model steam clubs have a 5" model railway track, most have 7¼" and some of the older clubs have 3½", but where do we run model road vehicles?

With these thoughts in mind, I was very pleased to receive an invitation to run on the Galston Valley Railway (Hornsby M.E.) new traction engine track. This track has been carved out of raw bush, leaving all the important trees, natural grades, bends and given a running surface of fine blue metal, the same type as used on the model railway track. It is approximately 200 metres along. The track had just been finished in time for the annual Galston birthday weekend by a team, which included present and future traction engine drivers.

Bill Fowler enjoys a drive through the bush at Galston Photo: D Proctor

I found it pleasant to run on, but one has to be careful with running through the scenic bush area, testing grades and tight curves. Most engines will have no problems. All I can say is that if you want a pleasant afternoon's run, try out the new track.

While I was happily running around, talking and generally enjoying myself, Howard Armstrong, a member of both Hornsby and Wagga Wagga clubs, (he who makes videos), asked why don't I come down to Wagga's invitation run and try out their new track. After mumbling under my breath... *yes.... maybe... .yes, will look at it,* he dropped the words "new track especially for traction engines running through the middle of the railway and round the gardens". (Their former track was back of the car park 100 metres long, of rough road base laid out in an oval pattern).



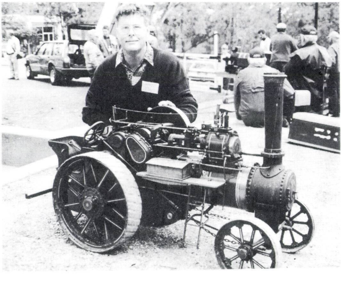
Two views of the Wagga Wagga road vehicle track with the station in the background (above) and the signal box (below) with the railway further up hill on the left. Who is the man on the traction engine? Photos: John Nicolson

Needless to say, my interest was stirred with the excitement of a new traction engine track to explore. After agreement from fair wife (who said she would pay!), we journeyed to Wagga Wagga to look at the new track.

After arriving at the club on Friday, we were met with the usual Wagga hospitality. Then the word from Harold was "where is the engine...now you must see the new track". We walked out into the middle of the railway track, next to the signal box and I was told, *This is the new track!* Behold, the new track was made between the up and down lines, wide enough for most traction engines at 900mm, and surfaced with fine road base, well packed down.

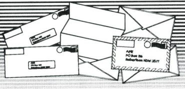
I was then taken on a route march past the club house up to the top of the block where they had constructed a roundabout, on through a gate and bridge to enable one to run into the Botanic Gardens, past the flower beds. Then it was back down the hill, past the club house, signal box, workshop and past the level crossing where they had constructed another roundabout and garden. From this roundabout there is an entrance to the gardens where further running can be had. The length of the track is 600 metres but this can be increased by running around the gardens. There are also passing areas where you can stop and chat. They have also added an innovation that is most welcome — an unloading ramp next to the railway unloading area, in the form of a dock. The surface where the track runs is fine crushed road-base and comments from the two 3" and 1½" scale traction engine drivers, was that it was very satisfactory.

My compliments to the Wagga club for a well thought out idea. A model road vehicle track where both the public and fellow modellers can see road vehicles and traction engines running beside trains is great, added to the advantage the drivers have of a smooth and interesting track to run on.



Alan Brumfield from Leeton NSW has just unloaded his engine at Wagga Wagga, his home club. Note the unloading dock to the left, behind the engine.

Letter Box



Things we used to do

Sir,

Dick Butcher's article on cylinder repairs (issue 75) prompts me to write. I find articles of this nature of particular interest. Doug Baxter's series relating a lifetime of experience on boiler work even more so. I only wish more people from that era would find ways to express themselves in these pages to share experiences or careers or knowledge that if rapidly disappearing with the passage of time possibly forever consumed by the natural cycle of life.

Like many people attracted to old machinery I have long had an interest in all things of an historical nature to one degree or another. With age, the futures of children to shape and a duty to share experience with work colleagues, I am all the more conscious of the importance of documenting the past as a reference for the future both in terms of preserving techniques but also and, probably more importantly, a benchmark by which to measure our own progress. As Dick says, "On reflection, how did we do such big jobs?"

People engaged in problem solving or performance analysis even on the simplest of scales will readily recognise the need to establish a benchmark. You must know where you were before you can measure where your have progressed to. Without a reference point it is impossible to tell whether you are heading in the right direction or indeed, whether you are making any headway at all. Many times I have seen good ideas put into practice with the firm belief that they contain the answers. Only when a disciplined analysis is carried out with reference to the benchmark can it be shown that an overall improvement has been achieved. It often comes as a surprise to find that the innovation was not nearly as successful as you thought. Often you discover that in aiming for point 'B' from 'A' you actually arrive at 'C' and reassessment and modifications are needed to correct your heading. None of this is possible without reference to the point where you started. That is why history is so important.

Equally, people interested in old machinery find a natural introduction to the way of life among the people that used the equipment and the prevailing attitudes of the time. Clearly, what is considered a hard days work (for example) these days does not compare to what was accepted fifty years ago. This is an insight that allows us to recognise that our lifestyles have changed very much for the better over the years. It is also bank of life experience available to everyone for research and assistance in dealing with our own day to day crises. We can look back at an event (say a war for example) and track the path leading up to that time and learn to recognise the signs while there is still time to divert from catastrophe.

On a more relevant note, I look at articles like Dick Butcher's and Doug Baxter's and compare the skills that existed then to what we are capable of now. We used to build our own railway locos, we built ships, big bridges, we were able to maintain these things and our workforce, as exemplified by the railway workshops, had an attitude that anything was possible; there was always a way, you just had to find it. Australians once had a reputation for independence, self sufficiency and most of al the ability to think on their feet, adjust to changing circumstances and win over in the fact of adversity. I have to say that I'm not so sure that this is still the case. As Australia more and more becomes a service economy and less and less a manufacturing economy I wonder what progress we have really made.

When I discuss these thoughts with people removed from historical passions the general reaction is "So what? Who needs riveted boilers?" "Why do we need to weld cylinders? There aren't any cylinders left to weld!". Of course I have to agree. If there are better ways to do things there is no need to preserve the old ways. Except, how do you know the new way is better if you can't remember the old way? We must have the benchmark.

More importantly, while the actual task or problem may no longer exist thanks to progress, different challenges and conundrums are encountered every day. The ability to approach solving a problem logically and successfully has never been more paramount than it is in the complex world of tody. Never before has the need to be flexible and innovative been more important in shaping the future of our Nation. The psychological skills to assess risks and the mental tenacity to overcome difficult challenges are more important than ever. These are the very values that we can learn from reading of the achievements of previous generations, of difficulties encountered and how they were dealt with. You know, "If they could do it back then we must be able to do now" or "This is how they used to do it, these were the problems they had, so we are going to try this way." In my mind, this is essential information for progress.

I am constantly inspired by the matter of fact way engineering problems used to be dealt with by unassuming trades people going about their daily work. For the benefit of generations yet to come I urge anyone with photos or stories of 'things we used to do' to put it down on papers in whatever capacity they can as it serves as an essential foundation for attitudes and thinking in the modern world.

Ross Bishop-Wear
New South Wales

An unfortunate experience

Sir,

In the best interest of model engineering would you please consider placing my letter in your magazine.

I read with great interest in your last issue "The Comment" which was raised about where have all the younger members gone. It should have read "Where have all the new members gone". At the outset let me say that - I have belonged to various clubs and associations for 20 years.

Never in my life have I struck a "Them and Us" closed shop mentality. I was made to feel like an intruder and a complete outsider so after four months I soon lost interest and heart and gave up. Added to this my old mate who is 76 years young joined a club recently as he wanted to run his loco. Reluctantly he was given a 12 months probationary membership on the proviso that he attend a working bee once a month and every run day, not to mention a rule book that was like a phone book. The Club in question was most upset that he couldn't attend "The Silver Tops" day once a week. When he explained that he had transport problems he was told by the president of the club he should go to another club!! So much for an old ex-digger who served his country well during the war!! Not only this he worked in 36° heat during a working bee. The Club in question ought to hang its head in shame.

Letterbox Contributions

Contributions of letters by mail to:
PO Box 176, Bundanoon, NSW, 2578 or
fax to: (02) 6254 1641 are very welcome.

You can also e-mail your letters to:
ame@dynamite.com.au

As far as possible, AME is an open forum for all members of our hobby. Therefore, all expressions of fact or opinion — as long as they are not libellous — will be considered for publication.

Please **type or clearly print** your letters, as script is often difficult for the typist to interpret.

The Letterbox is a popular medium of expression, so space is limited. Therefore, letters of 400 words or less will have a better chance of being published.

djp

Most clubs should realise that they are operating on crown land and membership should be open to all on the proviso that the new member adheres to club rules within reason. The new members should be made welcome and feel welcome, not to be treated like I was!! For the future of model engineering is in the hands of all clubs and members. So if you want to attract new members both young and old and survive well into the next century, change your attitude!! You know the saying "If the cap fits!"

Peter Royal
Victoria

A live steam GE tram?

Sir,

I am a newcomer to model engineering but have 'O' gauge Lima railroad experience (7mm/foot) as well as amateur radio as a current activity. It was great to collect my first copy of AME (Sep-Oct 1997) and send away for some back issues.

As a recent arrival to Launceston I have applied for membership of the Evandale Light Railway and Steam Society and have a wish to become actively involved there.

The GE tram engine (John Campbell AME Sep-Oct 97) was my main focus in buying the magazine initially as the tram engine is my favourite locomotive. I would like to build a live steam tram engine in 7¼", 5" or 3½" and would welcome advice, plans, boiler and engine to suit, parts etc for a steam version. In addition, I have a Petter AA 3.5 HP single cylinder diesel engine in working order and would like to run it as a tram engine of appropriate size. Does anyone out there have any information on such projects that they would share with me please? I am sure the members at Evandale will be very helpful but I am researching as widely as I can in the hope that can collect enough information to make an intelligent start in this hobby.

All correspondence will be answered and any photocopying paid for. Very good TLC assured for magazines, books etc.

Thanking you as I look forward to the next issue of AME.

Happy 1998 to staff and readers.

'Doc' Wescombe-Down
Tasmania

Hathorn, Davey & Co pumps

Sir,

I was most interested to read the extensive articles, Spotswood Pumping Station compiled by Dave Harper in the November-December 1997 issue of AME. I first must thank him for his acknowledgment of my assistance. The survival of the Hathorn Davey & Co pump is really a miracle and thanks must go to the MMBW for not scrapping this unique example of turn of the century engineering technology. The same can be said for the other artefacts contained in the pumping station also.

I would like to correct a misleading sentence in Dave's article contained in the section headed "A unique site". He states that the Spotswood engine is oldest surviving engine by the leading British firm Hathorn, Davey & Co. This is not quite correct unless Dave is only referring to the rotative type steam pump.

Two Hathorn, Davey & Co inverted vertical compound non-rotative steam pumps exist, virtually intact on the banks of the Burdekin River in Queensland, which once supplied Charters Towers with its water supply. I believe the first of these was installed between 1887-1889, probably 1888.

At Cheddars Lane, Cambridge in the United Kingdom, is a fully working example of a Hathorn, Davey & Co pumping engine. This consists of a horizontal steam engine coupled to vertical pumps through large discs resembling flywheels, but the engine is non-rotative and the discs only oscillate through approx 90 degrees. The engine was installed in 1894.

The remains of another Hathorn, Davey & Co horizontal non-rotative steam pump also exists in the United Kingdom although I know very little about it other than its existence and that it was probably installed last century.

The Spotswood pump is, I believe, a unique example of the triple expansion rotative pump design by Hathorn, Davey & Co, but certainly not the oldest pump.

The Charters Towers City Council had planned to replace the original non-rotative pumps with others similar to the Spotswood pump, however "modern" technology overran the plan and electric pumps were installed instead.

Peter Lukey
Queensland

Early model engineering in Australia

Sir,

During a visit to Victoria, my birth state, I called on Albert, an old school friend at Ballarat. I was telling him about restoring an engine from an Australian built motor car circa 1903, built by the Tarrant Motor Coy. of Melbourne. In 1934 this modified car was left in the custody of Albert's father, on his farm, where the water pump of the Tarrant fell to playful pranks.

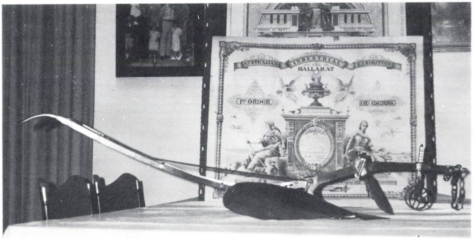
Now some sixty years later this pump was returned to me, as my friend had stored it in his garage, not being sure of its origin, after all those years. It will now fill an important missing part on this old engine.

Further on, during the evening's discussion, I remarked that as a young boy, I had seen at his father's, a miniature plough, housed in a glass case. This plough so impressed me that I had never forgotten it. And lo! my friend produced the model and here are a few details.

In the late 1800's in the central Victorian Highlands, there were many small blacksmithing and engineering enterprises emerging to fill the needs of the mining, timber-getting and farming communities. One young lad, who was seventeen years old, with hand tools alone, produced this very detailed model of a single furrow plough, approx. 30" long, in iron, draw-filed and polished. This model was exhibited at the Ballarat Industrial Exhibition in 1895, where it won 1st Order of Merit, and again at the Albury Industrial Exhibition held between September and November 1895, where it again took honours.

Sadly to say, the young model engineer's life was cut short in the next decade due to contracting typhoid fever, which was a deadly disease in the early days of our nation. I feel this is an interesting story covering our model engineering heritage, and hope all who read it get some of the enjoyment I received after thinking over what happened to that little plough I saw over sixty years ago, and this year seeing it again and getting the history of it from my old school friend Albert

Roy Stephens
Queensland



The single furrow plough from over 100 years ago sits on the table in front of the Merit Certificate from the Ballarat Industrial Exhibition Photo: Roy Stephens

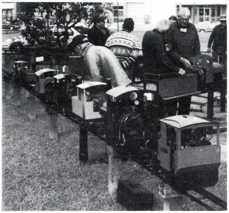
Blowflies in the Sweet Peas

A report on the SLSV *Blowfly* and *Sweet Pea* Weekend

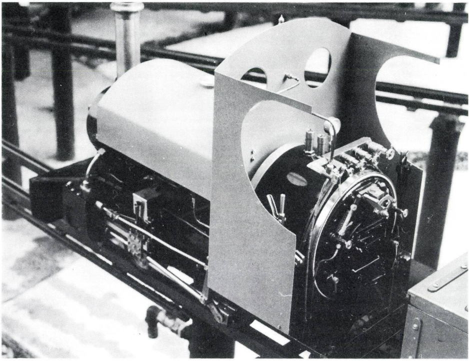
by Ken Rofe and John Campbell

photos by the authors

Last year when I (Ken Rofe) was compiling a list of SLSV members' locomotives and boilers I realised that we had a 'swarm' of Blowflies and a 'bunch' of Sweet Peas in the club. After some discussion with the executive it was decided to hold a Blowfly and Sweet Pea Invitation Run in May.

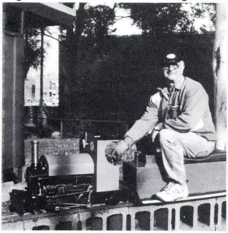


The steaming bays were full of Blowflies and Sweet Peas



A closer look at Allan Tregea's new Sweet Pea.... Note the neat banding!

What a great weekend it was! (John Campbell takes up the story). The weather was kind to us and on Saturday 110 people put their names in the attendance book, followed by 59 on Sunday. There were over 40 exhibits, 7 Blowflies, 7 Sweet Peas, 16 other steam locos, 6 electric locos, 2 partly built traction engines, 1 vertical steam boat engine and other mechanical exhibits, including Rod Hudson and his workshop castings.



Allan Tregea (SLSV) takes his new Sweet Pea for its first run on the track

The Blowflies and Sweet Peas all showed their builder's personal touch with variations in outline and colour. 3 Blowflies and 5 Sweet Peas were actually running, while the remainder were in various stages of building. We look forward to their completion and appearance on the track.

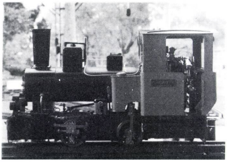
Engines which particularly took my eye included 5772, a GWR 0-6-0 tank by John Ramm from Ballarat, another unfinished GWR tank, 9716 by Cliff Kirby from Canberra, Peter Gray's NYC Mohawk in shiny black livery and the unfinished tram of Neil Fullager with planked cabin. Graham Tinkler showed the progress of his VR Garratt — what a passenger hauler that will be! I wonder which will be running first, the model or the Puffing Billy G42? Nev Owen's E1100 steeple-cab electric was a reminder of the locos which ran the suburban goods train of my youth, delivering loads of mallee roots to Sandringham.

For the record the following people brought Blowflies:

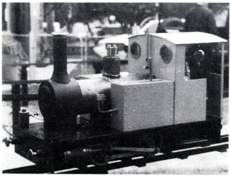
Len Stampton (BHPWP)	Black 0-4-0 *Tilda*
Lance Rawlings (SLSV)	Brass 0-4-0
Jack Orwin (SLSV)	Red 0-4-0
Harold Bone (SLSV)	Red 0-4-0
Graham Plaskett (SLS V)	Green 0-4-0
Will Beatty (SLSV)	Chassis
Cameron McMahon	0-6-0 wood lagging

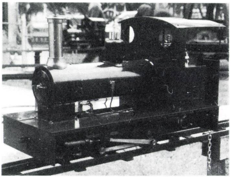
and the following people brought Sweet Peas:

Colin Stanton (SLSV)	Green 5796
David Smith (SLSV)	Blue Bluetit
Cliff Carter (BHPWP)	Green *John L Carter*
Mark Watkins (SLSV)	Green *Moriarty*
David Sutherland(SLSV)	Dark Red
Allan Tregea (SLSV)	Grey
Harold Bone (SLSV)	Metre Maid chassis
Brian Strevens (SLSV)	Metre Maid chassis

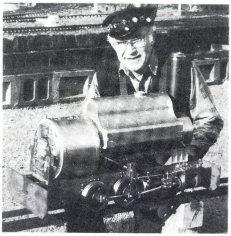


Mark Watkins' Sweet Pea Moriarty *(above and (below) Graham Plaskett's almost completed Blowfly*





This clean-lined Blowfly belongs to Jack Orwin (SLSV)



Brian Strevens (SLSV) shows off his part-built Metre Maid

There were other many other locomotives present, mostly from SLSV members, Cliff Kirby from Canberra with his GWR 9716, being the only one from interstate.

The weekend was thoroughly enjoyed by all who attended so much that SLSV will be doing something again this year. According to Ken Rofe it will be a different event...Watch AME!

....*(Continued from p. 24)*

piston stroke. Axle and crankpin diameters can be changed with some difficulty but if the stroke is changed, jigs #1 and #3 must be completely remade. If a jig plate is large enough, there's no reason why a new crankpin hole can't just be bored somewhere else on its surface.

Jig #2 is specific for a particular journal diameter. Axles can be profiled or shaped and they can have different wheel bore diameters with shoulders, but no part of the axle can be larger in diameter than the journals themselves.

Coupling rod lengths are equal to the centre-to-centre axle spacing and therefore are completely independent of the jigs

Advantages

This system ensures that:-

- Quartering will be exact because all the parts are machined the same and are independent of marking out.
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- There are no more unreliable scotch keys because drills drift off centre in the cast iron and go oversize.
- No more temporary or permanent shonky "pins".
- No more cumbersome and non-reproductive jigs assembled on the lathe bed.
- Wheels are completely interchangeable, even to the extent that there are no "left" and "right" sets.
- Broaching is so much faster, easier and with the appropriate jig, more reproducible than slotting in the lathe or by hand, that it's a no-contest.
- Left or right leading is instantly selectable by the builder at the stage of doing the axles, which is where it is determined.
- If you break a wheel or have some machining disaster, for as long as you keep jigs #1 and #3, you can go back and make a new one - one that you can be sure will replace the old one perfectly with the same rods. No re-fitting will be required.
- If a one- piece axlebox has to be replaced or rebored, the axle can be pressed out of the wheel. Loctite only hinders this process so avoid it when you don't really need it. The key ensures it can be put back again later in the identical position.

This system is ideal for making two or more similar engines.

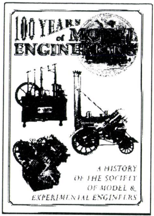
Product Reviews

100 YEARS OF MODEL ENGINEERING

A History of the Society of Model & Experimental Engineers

The Society of Model & Experimental Engineers was founded 100 years ago this year by Percival Marshall, who also founded what is now the *Model Engineer* magazine around the same time. To commemorate this unique milestone the SMEE have published a book which very comprehensively covers the background behind the establishment of the Society and its complete history, right from the very beginning through until the present day, where it has over 700 members world-wide. Throughout the 128 pages there are many excellent black and white photographs which provide a good visual record of the entire period which complement the well written, easy to read style of the text.

The long history of the SMEE has seen several moves, the hardship of the war years (twice) and great camaraderie. Amongst the many members of the Society over the years have been some of the better known names in the hobby— Dr. Bradbury Winter, Bill Carter, J N Maskelyne and Edgar Westbury to name a few. There is a wealth of detail and numerous anecdotes about the many events in which the Society has been involved, the people and their models, as well as some interesting insights into the characters behind the faces.


100 YEARS of MODEL ENGINEERING
A HISTORY OF THE SOCIETY OF MODEL & EXPERIMENTAL ENGINEERS

The review copy is heavy duty, soft-covered glossy card, but it is also available as a limited edition hardbound edition. The pages are high quality semi-gloss giving excellent reproduction and a feel of quality. The book was written by SMEE Vice President, Eric Ball, himself a member for many years. The comprehensive Index makes it easy to find almost any topic, which is quite an achievement in this type of publication.

Because the 100 year history of the SMEE is a direct parallel to the history of model engineering in general, this book should appeal to many involved in the hobby, aswell as representing good value for money .

100 YEARS
OF MODEL ENGINEERING
Available from the SMEE through: Ann Hatherill, 74 Shirley Avenue, Croydon, Surrey. CR0 8SH England
Prices are: Softback £10.00 (plus £2.00 post.)
and Hardback£20.00 (plus £3.00 post.)
(Remittances payable to "SM&EE")

...djp

News Desk

compiled by David Proctor

Welcome to another issue crammed, as usual with good reading and things to do. You may have noticed that a "new lad on the block" has kindly taken on the role of compiling the Club Roundup. Many thanks Neil, it is much appreciated

A noticeable 'glitch' occurred in the last issue. The photo on page 38 was taken from a colour laser copy, so now we know to shy away from these and stick to originals.

Some people have commented that articles are sometimes slow to appear in print. All preparation is done by volunteers working in their spare time, and at times it takes a while to get an article ready. This is particularly so when there are drawings to be prepared for publication. You may recall, in the last issue, I mentioned we were short of people who could draw. Rest assured, your articles will appear, we do not throw them away.

Some of you have said that receipt of your work has not been acknowledged. For that I can only apologise — we used to always acknowledge receipt of every item received, but in recent times, for reasons like being short-handed we have fallen down. Over the last year we have taken steps like appointing someone to co-ordinate article preparation, which will help ensure that it doesn't happen again. I thank you for your patience. Perhaps you could help to save us some time too. When sending in articles, regardless of the type of article, try to use A4 sized paper. Little scraps, cardboard corners and bits of wood tend to get lost sometimes and are hard to read!

New pleasure places

No, not that! Recently I have heard of several new "our type" operations. The first one is Graeme Clarke's 7¼" railway near Bairnsdale in Victoria, where he will be operating his 'Bunyip' *Kaye-C* every Saturday. I believe this railway opened on January 17, and I'm sure that Graeme will tell us more .

Still in that part of the world, the Coal Creek Heritage Village operate a Bundaberg Fowler (B/No.7/1952) on 2k of two foot gauge track near Korumburra. The loco sat in Bundaberg for many years before being purchased and restored to running order. It was re-commissioned in December.

In Queensland, the Grandchester Model Live Steam Assoc. are staging the grand opening of their track on 1 August. (see Coming Events). This is timed to tie in with the Q R Heritage Weekend. Railways in Queensland began with the opening of the Ipswich to Grandchester Railway 133 years ago.

Finally, if you look in the Club Roundup, you will see that Toowoomba and Tullamarine clubs are both back in operation.

Ideas

Some suggestions have been put forward by a couple of our readers. One is a type of "Help" column where you can ask for advice and answers are printed in the following issue. Another is a "Reader's" page where there is an unedited exchange of ideas. I feel our Letterbox section provides a forum for these. (Any column would be edited as far as any offensive or libellous content goes.). The third idea is for AME to print a prototype rolling stock drawing each issue (one page G.A.). What do you think?

MEANZ

A note from Warwick Allison, after discussion with Alan Mackellar about the recent AME article on MEANZ (Nov-Dec issue). "Steam Chest" was a J. Ferguson, "NCL" was certainly Cec Mackellar. The *Iron Duke* owned by the late George Farkas was actually built by Maurie Haynes around 1969.

Finally, heard on the grape-vine that the Victorian manufacturer of char has stopped production.

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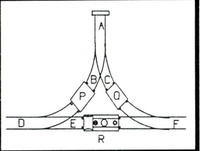

The engine **R** pushes **P** to **A** and leaves it there. returns and pushes **Q** up to **P** in **A** and draws both **P** and **Q** out along **F**. then pushes them back along **E** and leaves **P** there. Then **R** takes **Q** back. pushes it up to **A** and leaves it there. **R** comes back draws **P** out of **E**. pushes it along to **C** and leaves it there. **R** then runs along **F. E. D. B** and draws **Q** out into **B**.

(Found in a Ballarat newspaper dated Sept 4th. 1897...courtesy of Big Wheel News.)

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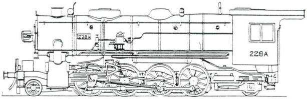

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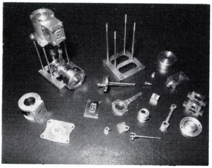

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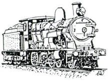

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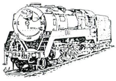

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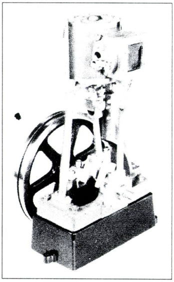

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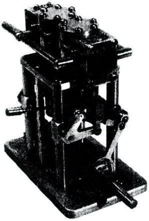

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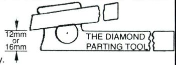

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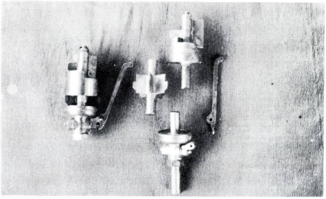

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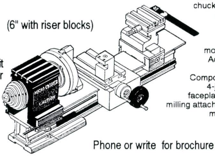

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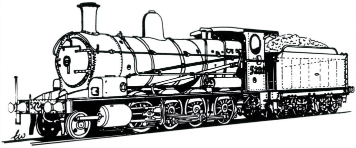

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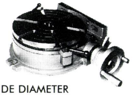

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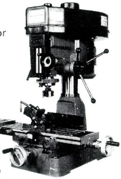
- Heavy Duty 2HP 240V TEFC motor
- Weight 300kg
- 3m spindle
- Chuck & vice supplied
- Table 730mm x 210mm
- Top quality finish



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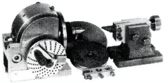
- Hardened & ground spindle & worm
- Ratio 40:1 • Can divide direct or indirect
- Head tilts to 90°



100 (4") **$575**
125 (5") **$675**

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3-JAW SELF-CENTERING Reverse Jaws				4-JAW Independent	
80mm	$125	200mm	$227	100mm	$105
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BS4 METAL BANDSAW
- 115mm capacity • 240V
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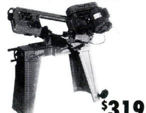

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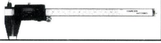
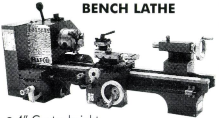
300mm/12"	**$189**	(M743)



BENCH LATHE



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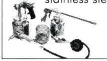

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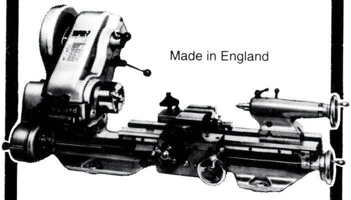

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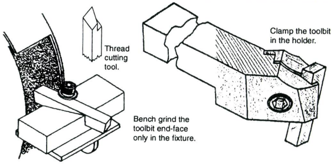
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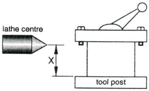

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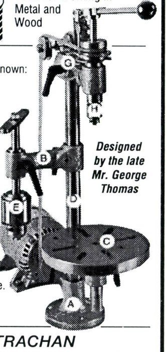

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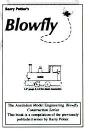
422 class Battery Powered Locomotive Drawing list

AMELOCO 2/2	Schematic diagram - Armatures & Fields in Parallel (24Vdc)
AMELOCO 3/3	Wiring diagram - Armatures & Fields in Parallel (24Vdc)
AMELOCO 4	Triangular Wave Generator (Dual Output) - Circuit Diagram
AMELOCO 5	Power Driver Unit - Circuit Diagram
AMELOCO 6/2	Fixed Cab - Circuit Diagram
AMELOCO 7	Headlight (Maglite) Voltage Regulator -Circuit Diagram
AMELOCO 8	Basic and Low Power De-coupling Units - Circuit Diagrams
AMELOCO 11	Basic Operator's Throttle with Infinite Throttle - Circuit Diagram
AMELOCO 12	Operator's Throttle with Notched Throttle - Circuit Diagram
AMELOCO 13	Basic Operator's Throttle with Infinite Throttle and Dead-man's Handle Reset - Circuit Diagram
AMELOCO 14/2	Schematic diagram - Permag Motors in Series (24Vdc)
AMELOCO 15/2	Schematic diagram - Permag Motors in Parallel (24Vdc)
AMELOCO 17/2	Wiring Diagram - Permag Motors in Series (24Vdc)
AMELOCO 20/3	Multiple-unit Interconnecting Cable and Bus Connector - Circuit Diagram
AMELOCO 21	Test Set - Operator's Control Unit
AMELOCO 22	Test Set - Triangular Wave Generator (Dual Output)
422CB-001-E	Locomotive Frame Assembly / Arrangement
* * * * * *	Frame Component Flame-cutting Templates
422B-001(E)	GM Cast Bogie Assembly / Arranement
422B-002	GM Cast Bogie Machining Details & Sundry parts (Sheet 1)
422B-003	GM Cast Bogie Sundry parts (Sheet 2)
422ED-01	24Vdc Electric Drive Assembly
422ED-02	24Vdc Electric Drive Sundry Parts Details

All above drawings are $12.95 if purchased singly or $9.95 if two or more in the series are purchased at the same time.

Golden Arrow (steam launch) drawings 1:1 scale (1 sheet hull template & 1 sheet boiler) $14.95



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Videos

South African Winter Steam $44.95

A look at reopened narrow gauge ex South African line in the east of the country and various Garratts hauling heavy coal trains on private colliery lines. This video contains brilliant scenery being traversed by "soon to be history" commercial steam workings, all filmed in the spectacular winter months. Running time - 55 minutes.

Steam Fever $44.95

Another South African video which looks at various aspects of mainline operations in the final days of steam, including "Red Devil" and a look at the Class 25 condensing locomotive - described as the "last ship of the desert." Many dramatic steam scenes are included along with the day-to-day activities of the crews which worked what must be described as one of the most modern steam systems running on 3'6" gauge in the world.

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Challenger Through The Rocky Mountains $44.95

This video records the 1991 trip across the US by Union Pacific 4-6-6-4 Challenger no.3985 and 4-8-4 Northern No. 844 from Wyoming to Sacramento, California. Many memorable shots are included particularly in the Rocky Mountains with their snowy backdrop. Cold conditions add to the spectacle of preserved super power at work.

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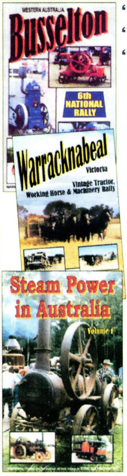

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WARRACKNABEAL — Tractors and working draft horses in the field. This video features a Lanz Bulldog parade of 17 tractors.

WYALKATCHEM — Tractors, stationary engines, machinery working in the field. This video features the Waterloo Boy, John Deere's first tractor.

POWER OF THE PAST — Rally held at Mt Barker South Australia featuring Clutterbuck engines and a host of other stationary engines and tractors.

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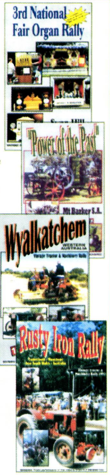

I.C. ENGINES Volume 1

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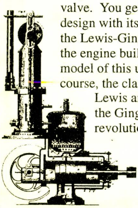
More unusual engines! Complete patents! Do they run. Most likely. Run well? I wonder.

What you get here are fourteen unusual patents from 1881 through 1890 that were chosen on the basis of their uniqueness.

You get Ravel's Oscillating Gas motor, AK Rider's gas engine, Hopkin's 1883 beam gas engine, Hiram Maxim's unusual vertical gas motor from 1884 as well as his short, squat combination internal combustion or hot air engine design, and more.

Included are all three James Atkinson patents. You get his original 1884 patent of a four-stroke gas engine with a slide valve. You get his unusual 1886 opposed piston design with its unusual linkage. (Rumor has it that the Lewis-Gingery duo, having again escaped from the engine builder's sanitarium, are developing a model of this unusual design.) And there is, of course, the classic 1887 design already built by Jim Lewis and Dave Gingery and published by the Gingery's that allows four strokes on one revolution of the flywheel. It's all here. The original specs from the man who invented it.



My favorite is the monstrous Hibbard rotary gas engine. You get seven pages of complex detailed drawings of an engine that must have been too complex for its time. This patent is also one of the poorest in quality that I've seen. (It looks like a copy of copy of a microfilm of a copy ...) With patience you can figure out this mind boggling engine.

You may want to try building a working replica of the Sharpneek rotary gas engine, or the rocking beam hydrocarbon engine of Brayton. It's not something you see every day.

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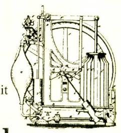

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